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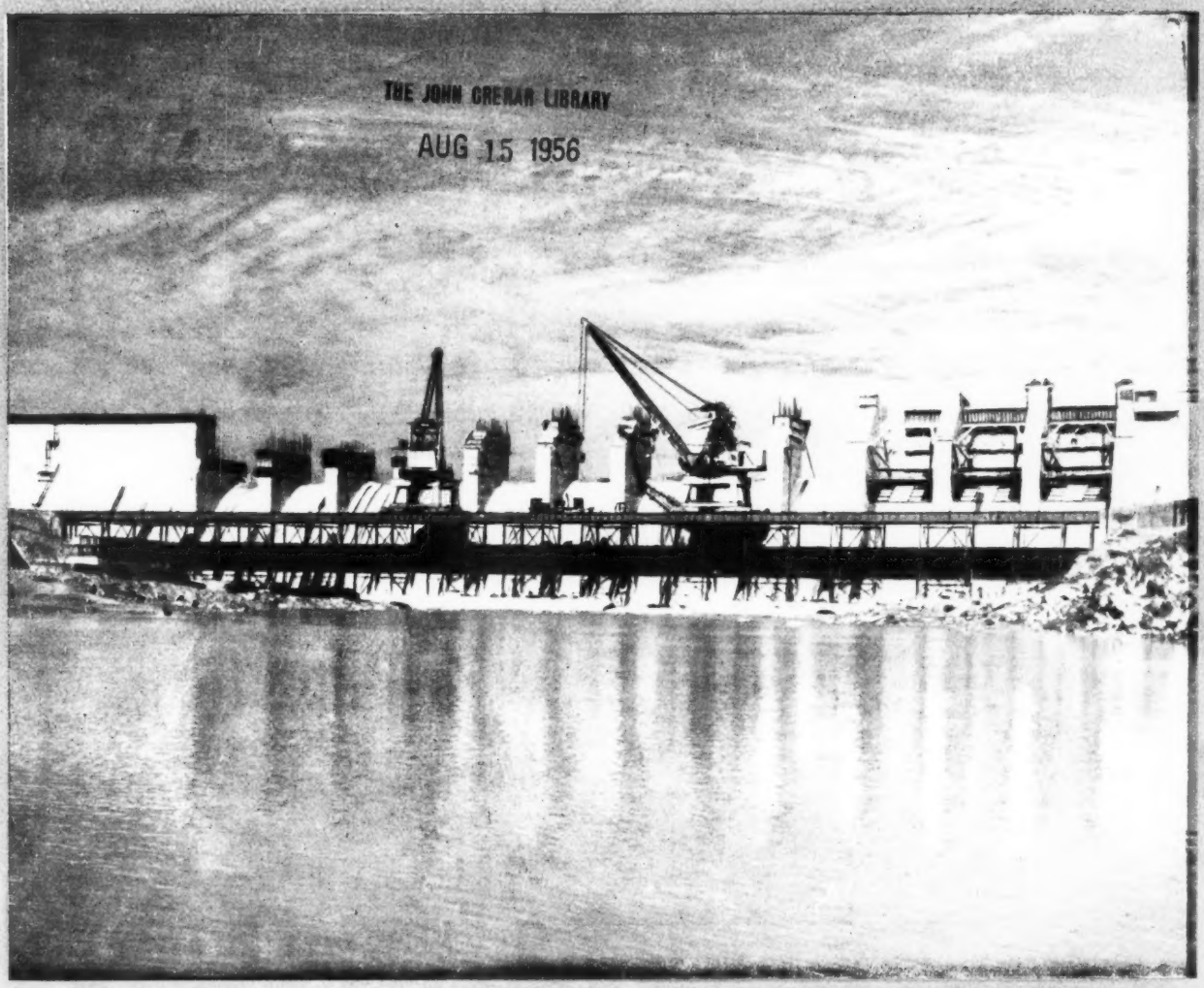
INDIAN JOURNAL OF POWER & RIVER VALLEY DEVELOPMENT

VOL. VI. NO. 2 FEBRUARY 1956 RUPEES TWO



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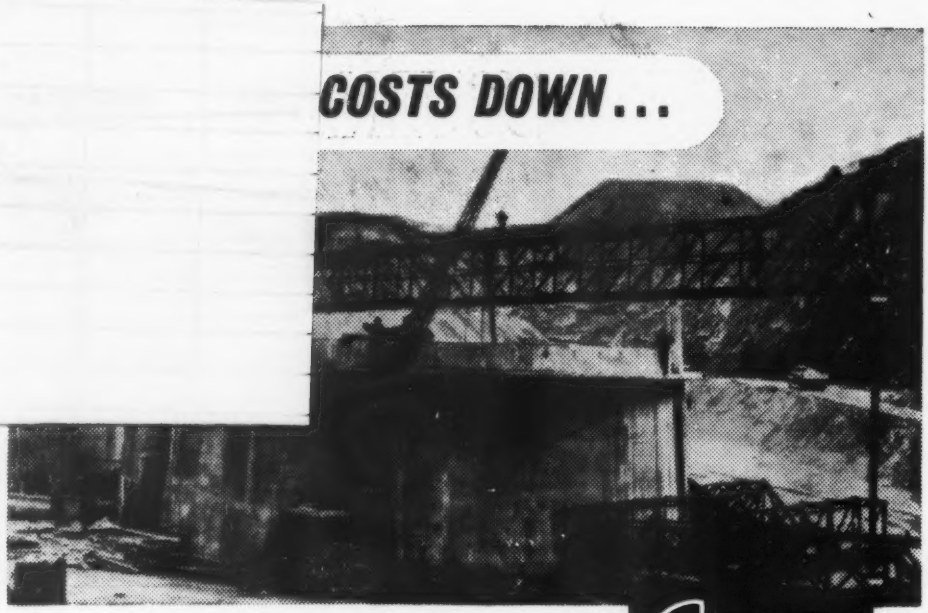

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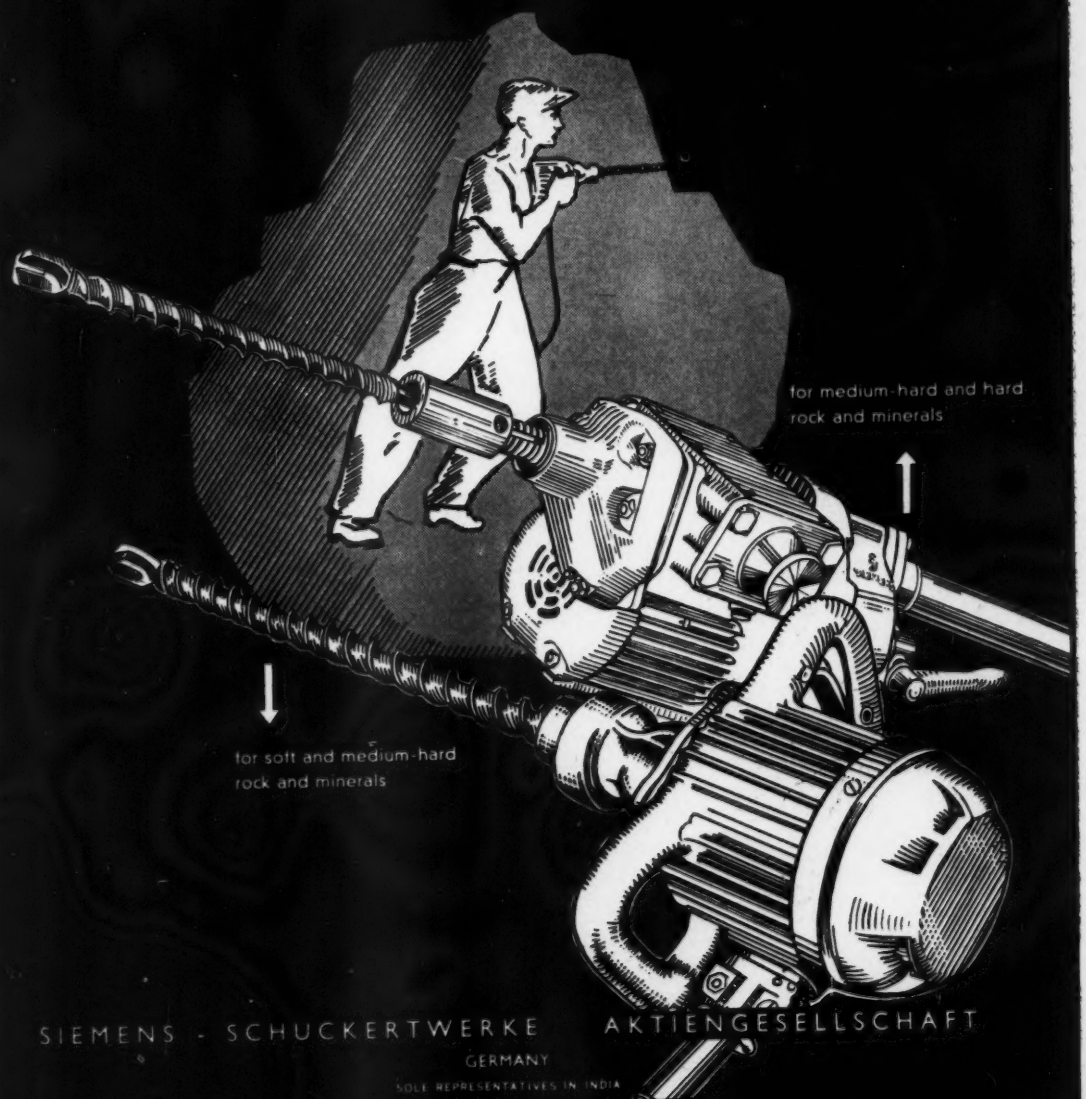

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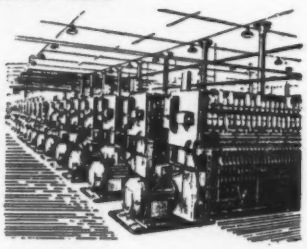

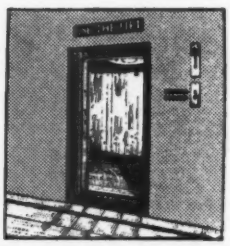

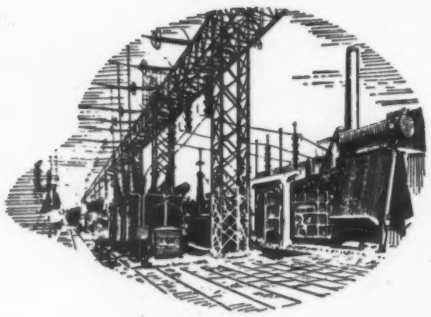

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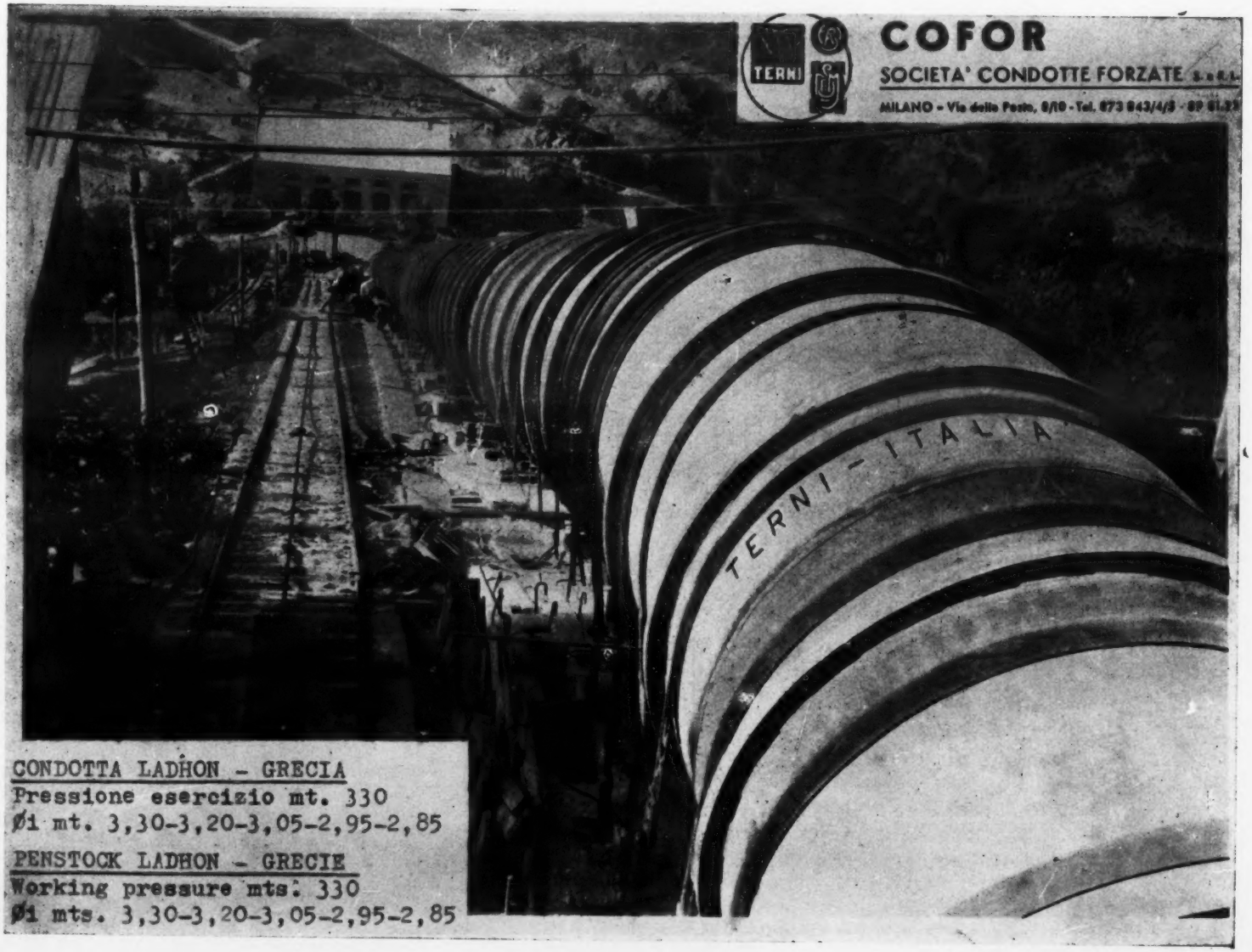

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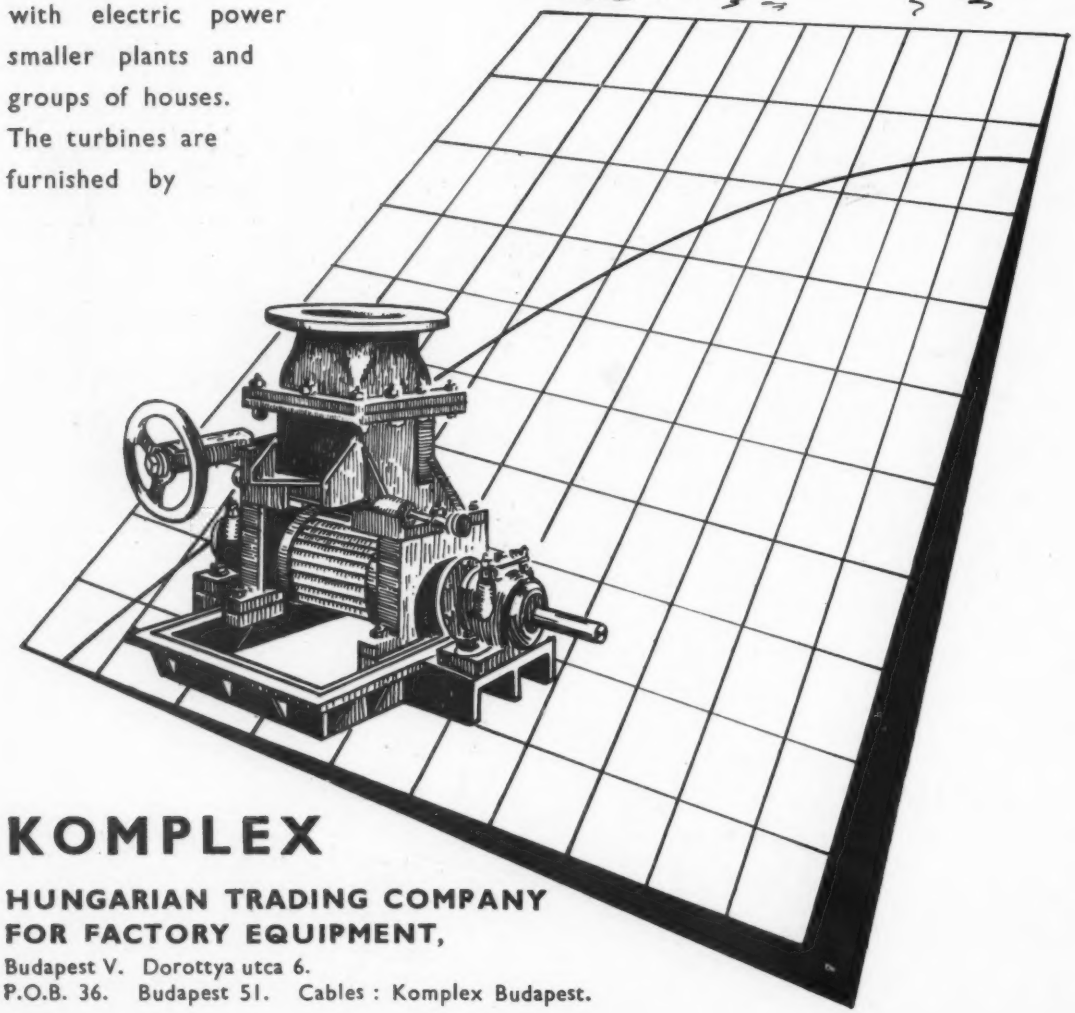

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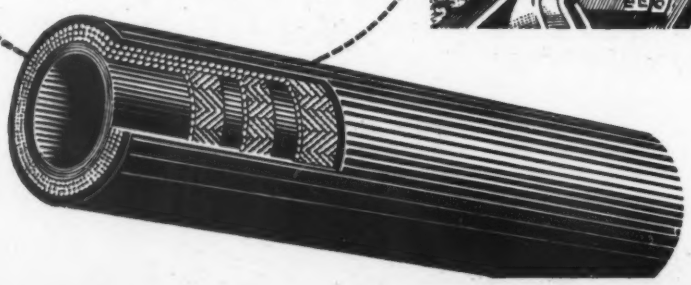

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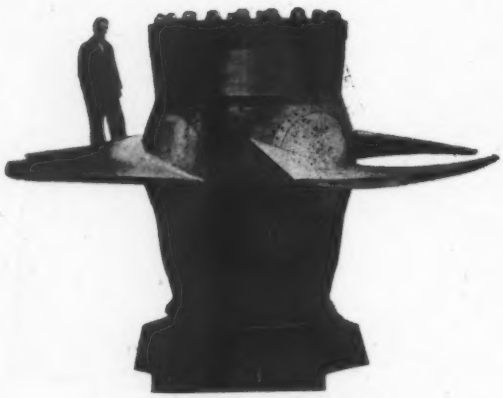

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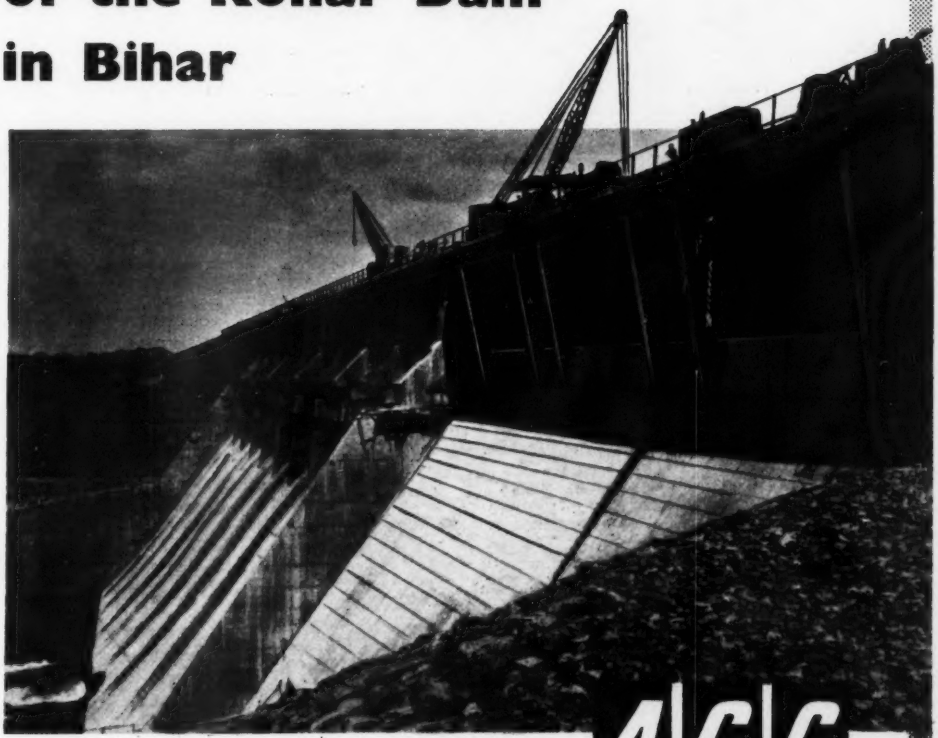

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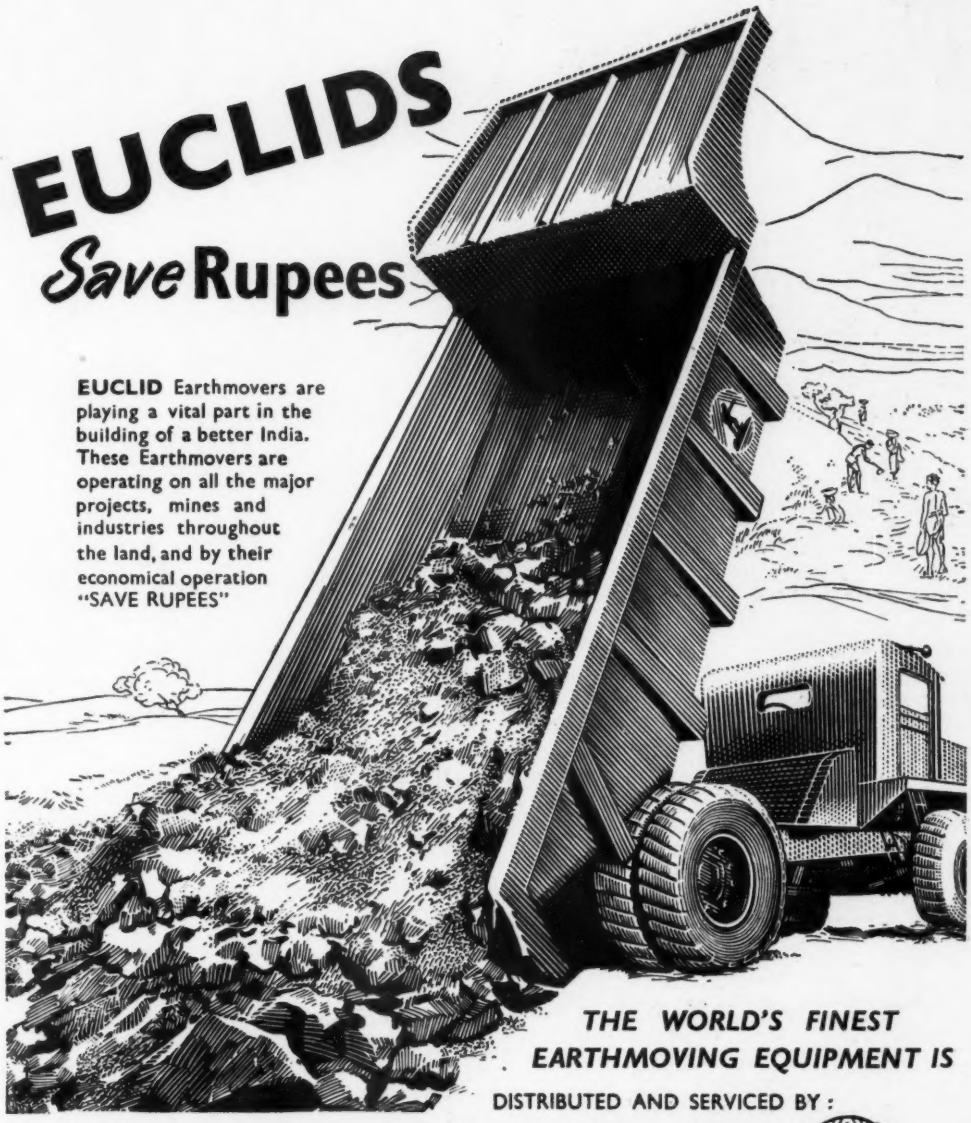

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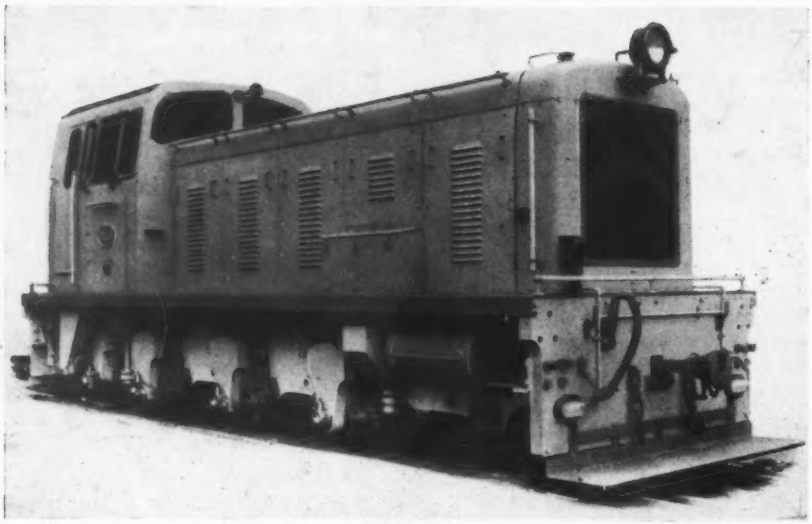

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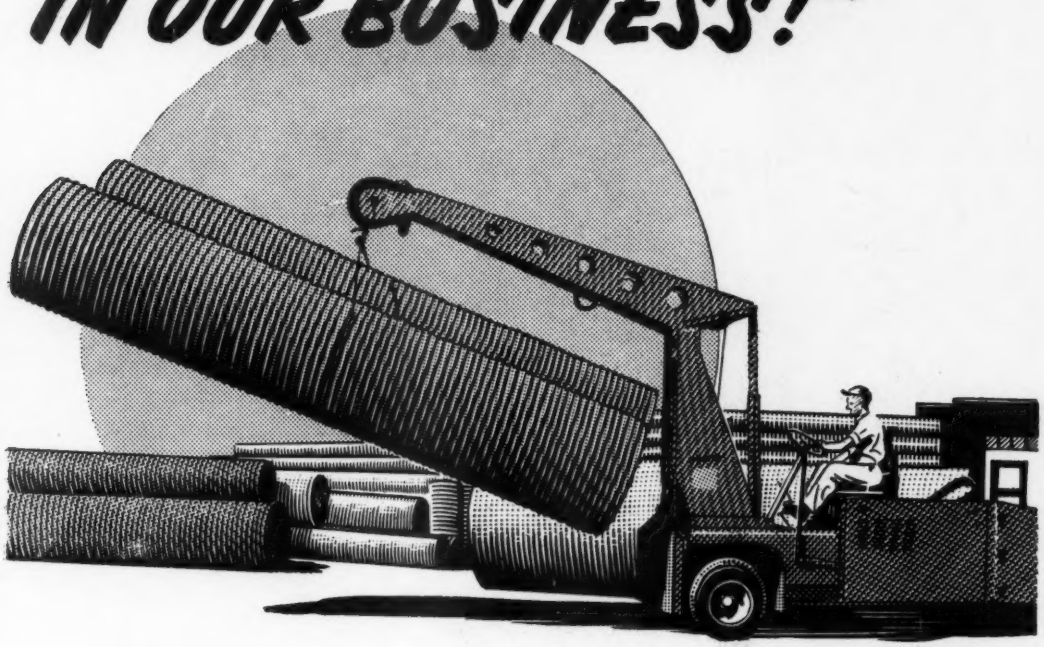

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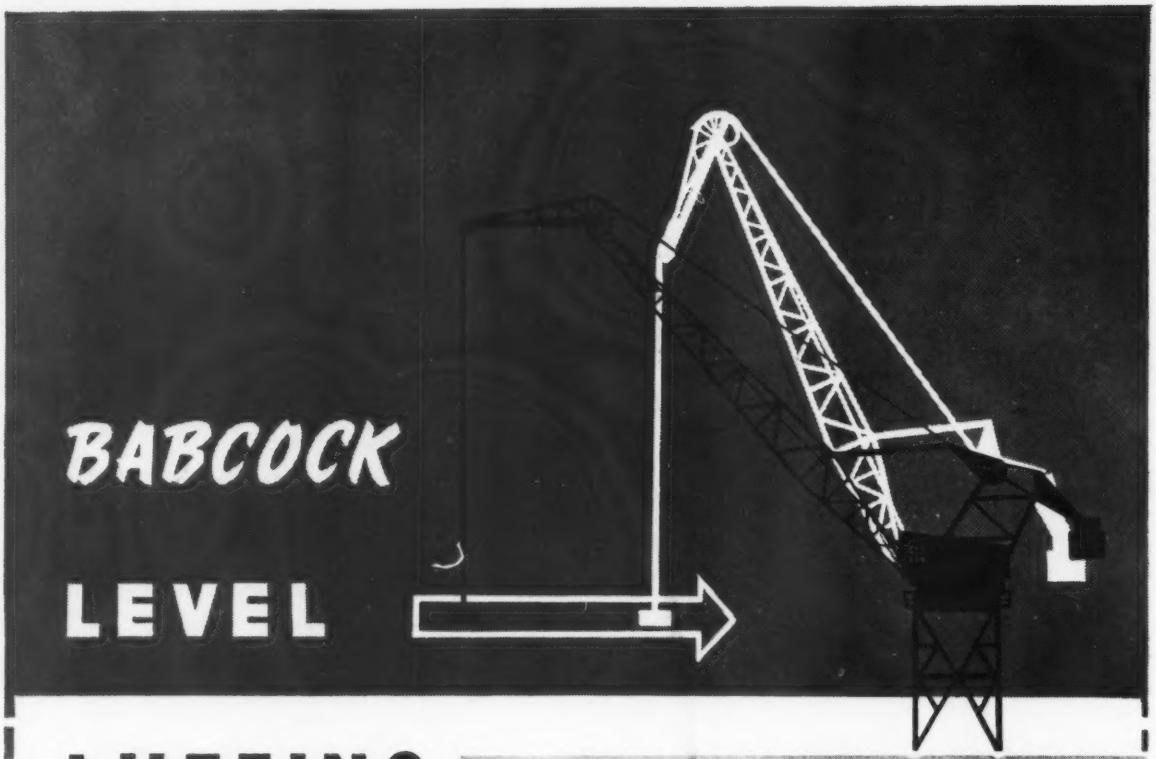

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A MONTHLY DEVOTED TO DEVELOPMENT OF POWER & WATER RESOURCES IN ASIA

Editor : K. K. Sinha

P. K. Menon : Mg. Editor

Vol. VI **February, 1956** **No. 2**

CONTENTS

MAGNETISED CURRENTS	.. ..	*B. K. Gokhale*	1
IRRIGATION AND POWER IN THE SECOND FIVE YEAR PLAN	..		3
FIFTH WORLD POWER CONFERENCE, VIENNA 1956—TECHNICAL PROGRAMME	.. ..		6
IRRIGATION IN MADHYA PRADESH	.. ..	*M. L. Sood*	9
ROLE OF MACHINES AT BHAKRA DAM	.. ..	*Vishnu Dutt*	11
ECAFE WORK ON ELECTRIC POWER	.. ..		15
NOTES & NEWS			17
OUR DELHI LETTER	.. ..		19
THE SECOND PLAN	.. ..	*Editorial*	21

In the coming issue :

India's Practices and Policies in Dam Construction *by* A. R. Venkatachari, I.S.E. (Retd.), M.A.S C.E., Chief Engineer Madras (Retd), Padma Bhushan ; Floods and Flood-Control *by* R.L. Phansalkar, Irrigation Development Division, Bombay ; Reflections in Geneva Atomic Energy Conference *by* R. F. Masters, Editor, BEAMA Journal ; Rural Electrification Demonstration Centres ; Electrical Power Conferenee of ECAFE Countries ; DVC and the Government —Editorial.

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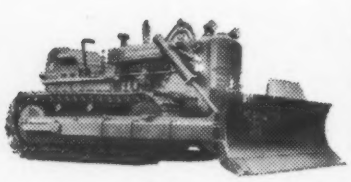
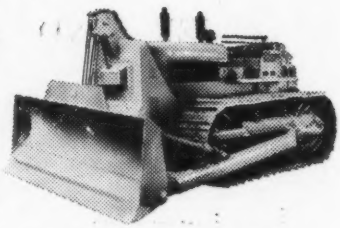
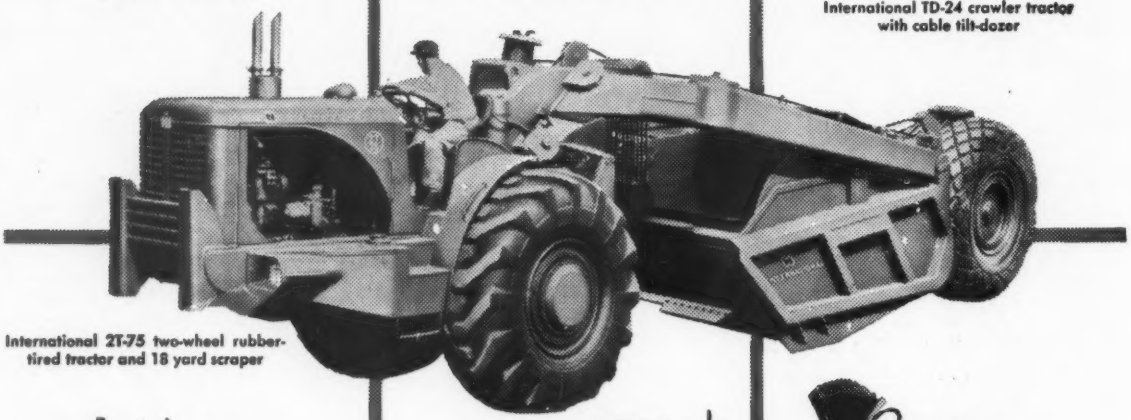


International TD-24 crawler tractor with hydraulic bullgrader

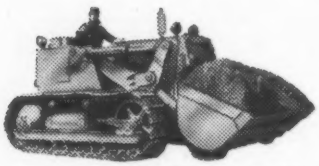
International B-250 four-wheel scraper for use with the TD-24 tractor



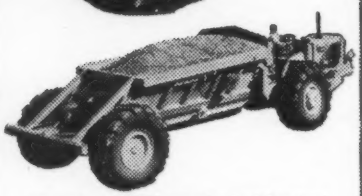
International TD-24 crawler tractor with cable tilt-dozer



International 2T-75 two-wheel rubber-tired tractor and 18 yard scraper



International TD-14A crawler tractor with hydraulic skid-shovel



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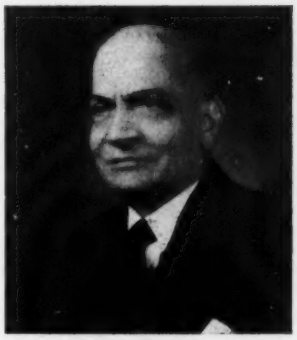
Magnetised Currents

B. K. GOKHALE

The esteemed author of this article is welknown to all those who are at present connected with large river valley and power projects in this country. It was during his stewardship as Secretary of the Ministry of Irrigation and Power that such projects as the DVC, the Bhakra Dam, the Hirakud, the Tungabhadra projects etc. emerged through the long process of Ministerial and Parliamentary consideration. We publish his rather controversial though interesting approach towards rivers, with the hope that this will provoke thought. While we share his concern for caution regarding the modern man's over-confident attitude towards rivers, we could not share his almost traditional mystical approach. We know more than we knew before, and we have to know still more about nature but strictly with the aid of the scientific method.—Editor.



AUTHOR

Since time immemorial, rivers have been regarded in India as mothers, if not as Goddesses, who nourish humanity without asking for any return.

In a country where rainfall is limited to about three months, rivers provide water and help to produce food throughout the year. Water transport enables the food to be taken where it is needed. Water power helps to grind the corn. Annual floods bring down silt to enrich the soil.

Long before Municipalities and Corporations were thought of, rivers have been serving as nature's Public Health Departments and giving the country a succession of spring cleanings throughout the year.

River banks generally serve as Community Centres where people meet and exchange the latest gossip, bathe, wash their clothes and generally amuse themselves. Stories of Shri Krishna disporting himself on the banks of the Jamuna with the young men and women of Brindavan have played an important part in the spread of Hindu religion and culture.

River valleys have generally been the cradles of civilisation throughout the ages. The fact of food and water being readily available no doubt explains the location of cities and the growth of population. But it would be interesting to know whether it is only the physical availability of water which accounts for the rise and fall of different cvilisations and cultures or there are other mysterious influences at work. Why is it that each river valley produces its own distinctive type of civilisation? Are the properties of water in each river entirely due to the terrain and the type of soil through which the river runs its course?

River research stations are still in their infancy. They have only just begun to explore the physical characteristics of these mighty currents which bring life and death to the people and carry on their work relentlessly throughout the ages without the slightest concern for the rise and fall of Empires, the reshuffle of State boundaries, the ambitions of Princes and so on. The strength of these currents is apparent from the manner in which they wear out the highest mountains and push out the sea to form new land. It may well be said that Bengal is a gift of the Ganga and the Brahmaputra to the people of India.

Multi-purpose river valley projects deal mainly with three types of currents. Irrigation engineers have firstly to deal with the terrific currents of flowing waters. The foundations of dams have to be strong enough to withstand the fury of floods. Next comes the question of utilising stored waters through canals and distributaries to maximum advantage. Hydro-electric engineers convert the energy of flowing waters into electricity which is transmitted to centres of distribution at very high voltage and ultimately fed to consumers at the appropriate strength and frequency. The electric net-work is a more complicated affair than the masonry structures which deal with the irrigation system. But even more complicated are the currents of thought which have to be canalised and directed along right channels, firstly with a view to complete the project as economically and expeditiously as possible ; and secondly to ensure that the end products of water and electricity are wisely utilised to increase production, and raise the standard of living of the people.

The analogy between the distribution system of electricity and water is obvious. Each light point is the tail end of a minor distributary on the electrical net work. Yet it is only a thin copper wire which guides the current over long distances unlike canals which have to be comparatively large even at the tail end. The difference is due to the currents of waters being solid and substantial unlike electric currents which are more etherial.

Science advanced a step further when it discovered wireless transmission. At first, scientists postulated an ether to explain the transmission of wireless waves through space. Now apparently ether has been discarded and nobody really seems to know how wireless waves are transmitted. Television records a further advance in our knowledge of wireless currents. It may not be long before we have wireless transmission of heat and power over long distances to bring to the door steps of all villagers the material benefits of modern civilisation.

Would it be too fantastic to speculate that we may

B. K. GOKHALE, I.C.S. (*Retd.*) *is Chairman, Board of Control, Tungabhadra Project and Ex-Secretary, Ministry of Irrigation and Power Government of India*

also be nearer to the discovery of still more etherial currents e.g., the powerful currents of thought set up by highly evolved individuals who have specially trained their minds and adapted their brains to serve as transmitters and receivers of thought throughout the world. The fact of telepathy is now being recognised. But it may be long before Western scientists are prepared to conceive the possibility of Sri Sanjaya of the Bhagawad Gita being specially endowed with supersensory perception to see and hear with his brain what was happening and being said miles away on the battle-field of Kurukshetra.

Unlike many who regard Homeopathy as a quack remedy, people in India generally believe in homeopathy which is based on the theory of "the greater the dilution, the higher the potency." The idea of magnetising water by repeating *mantras* is only a step further into the realm of the unknown. It is indeed not merely the physical repetition of the *mantra* which is responsible for the magnetisation but the thought accompanying it. Many in India believe that water can be magnetised by repeating certain *mantras* and that magnetised water has a potency for curing disease and effecting other so-called miracles.

Is it inconceivable that the ancient *Rishis* in the Himalayas are magnetising the waters of the holy Ganga for the benefit of humanity? It is common knowledge that Ganga water remains pure and uncontaminated longer than water from other sources. This may be due to its being highly magnetised and able to withstand infection. It may also well be that the potency and the effect of the magnetisation is all the greater in particular stretches of the Ganga where the current flows from south to north as at Banaras.

While it is only right that we in India should take advantage of Western technology to provide our people with material comforts in the shape of food and consumer goods, we should not lose sight of our ancient heritage. Spiritual truths may be incapable of proof by mechanical devices. But they are none the less capable of perception by deep spiritual insight. In India, at least, let us not forget that the very foundation of a multi-purpose river valley project is the river itself. Let us not forget also that we have always regarded rivers as spiritual entities which deserve the highest respect. Let there be no idle talk of taming this river or harnessing the other. The Kosi is not a wild animal to be tamed by our engineers ; nor is the Damodar a pony to be harnessed to our chariot. Let us treat rivers with the respect and reverence due to them and humbly seek their blessings and co-operation. It is, perhaps, a sign of humanity reaching adolescence that rivers are now accepting our co-operation. Let us extend such co-operation not as masters but as beneficiaries who would like to be helped to an extent greater than ever before in the history of mankind.

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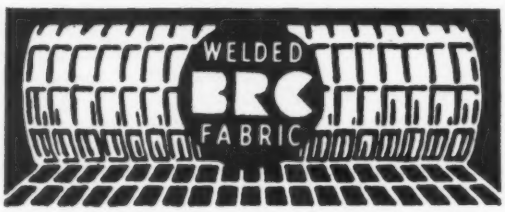

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Irrigation and Power In the Second Five Year Plan

By

PLANNING COMMISSION

Government of India

The irrigation and power programmes in the first five-year plan were undertaken as the first phase of a long-term plan. After examining the available data targets of development to be achieved over a period of 15 years were formulated. In doing so the primary aim was to ensure the utilisation of the water resources of the country to the maximum extent possible.

Two General Principles

Apart from various technical and economic considerations in selecting projects for irrigation and power, two general principles have to be kept in view. The first is that there should be a balance between large projects and medium-sized projects. Large irrigation and hydro-electric schemes take several years to complete and generally yield full benefits after a considerable interval. Medium-sized projects, however, yield early results and ensure a measure of continuity in the flow of benefits. At the beginning of the first plan a number of major projects were already in progress, so that possibilities of selecting new projects were severely limited. In the second five-year plan, besides carrying forward the various multi-purpose and other large projects begun during the first plan, preference has been given to medium-sized projects. The second principle in drawing up a national plan for irrigation and power development is to keep in view as far as possible the requirements of all regions in the country. This aim has been followed in proposing projects for the second plan. This will be seen from the statement at the end of this note which indicates the additional area to be irrigated and the additional generating capacity to be installed in each State during the period of the second plan. During this period the total investment on irrigation and power will be of the order of Rs. 900 crores as compared to the provision in the first plan of Rs. 661 crores.

Irrigation

At the beginning of the first plan the total area under irrigation from all sources was 50 million acres. Of this, 18 million acres were irrigated by Government canals, 2 million acres by private canals, 13 million cares by wells, 9 million acres by tanks and 8 million acres from other sources. The area that received secure irrigation from large and medium sized irrigation works was only about 25 million acres. The doubling of this area by irrigation works, which would remain effective in years of low rainfall, was adopted as a target to be achieved over a period of about 15 years. Progress achieved during the first plan and programmes to be undertaken in the second plan suggest that this target is likely to be fulfilled.

During the first plan 7 million acres would have been brought under irrigation by large and medium sized projects. During the second plan the area to be irrigated is expected to be 12 million acres. Out of this, 9 million acres will benefit from projects undertaken during the first plan and 3 million acres from new projects included in the second plan. The area which these new projects will eventually irrigate is 15 million acres. Like the first plan projects, the new projects included in the second plan will also yield the major part of their benefits during the period of the third plan. In this period the additional benefits of irrigation carried over from the earlier plans are expected to amount to 12 million acres. These figures illustrate the continuity of efforts and results in the development of irrigation.

Out of 188 new irrigation projects, 136 will cost less than Rs. 1 crore ; 34 between Rs. 1 crore and Rs. 5 crores ; 8 between Rs. 5 crores and Rs. 10 crores ; 9 between Rs. 10 crores and Rs. 30 crores ; and only one more than Rs. 30 crores. Thus, to balance the big multi-purpose projects which distinguished the first five-year plan, most of the new irrigation schemes to be undertaken during the second plan are of medium or small size and will yield results in quick succession.

Smaller irrigation works, such as wells, tanks, and minor irrigation channels, play an equally important part in developing irrigation. In 1950 they accounted for about one-half of the irrigated area of the country. During the first plan 10 million acres would have been brought under irrigation from minor works. The second plan also provides for the irrigation of 9 million acres from these works.

Programmes of the dimensions described above raise difficult questions of finance. The capital costs which they entail are much larger than those in the earlier projects. The costs of maintenance and operation have also risen a great deal. In considering these problems two principles have to be emphasized. The first is that areas which derived facilities for irrigation, especially canal and tubewell irrigation, should pay betterment contributions towards the capital cost of the project. Secure irrigation adds considerably to the value of the land and it is fair that a proportion of this added value should accrue to the community for financing future development. The second principle is that irrigation rates have to be determined on a commercial basis. In several States irrigation rates were fixed many years ago and may not take sufficient account of the increase in the value of crops which has since occurred.

Power

The growth of energy resources is one of the principal foundations of industrial development. The consumption of electricity is rightly cited as an index of economic development. Until a few years ago, in spite of her resources in water and coal, India's power development proceeded very slowly. At the beginning of the first plan the total installed capacity of power generating plants amounted only to 2.3 million kW. Of this about one-half was held by electricity supply companies, which operated mainly in the bigger towns. About a quarter of the installed capacity was in the public sector, the balance being in industrial establishments which generated their own power.

Even more than irrigation, power development requires long-term planning. In a developing economy power requirements frequently outpace even optimistic estimates. This has already happened in India. At the beginning of the first plan, with the greater emphasis on irrigation which was then imperative, it was reckoned that installed capacity should increase by 7 million kW over a period of 15 years. It is now likely that this target for installed capacity will be achieved much sooner. New developments may change the prospect in a manner which cannot yet be foreseen in detail. Promising beginnings have already been made in respect of nuclear energy.

During the first plan installed capacity has increased by 1.1 million kW to 3.4 million kW. In this the share of the public sector has grown from 0.6 to 1.4 million kW. In addition, work on power plants with an aggregate capacity of about 0.2 million kW has almost been completed, and these will be commissioned before the end of 1956. During the first plan period per capita consumption of electricity has risen from 14 to 25 units. About 19,000 miles of subtransmission and transmission lines of 11 kV and above have been added, thus more than doubling the transmission network which existed at the beginning of the first plan. As against 3687 towns and villages electrified early in 1951, the number at the end of the first plan will be about 6,500.

It has been estimated that over the next 10 years installed capacity will need to be expanded by 20 percent annually. This means that for 1966 the target should be about 15 million kW. This is the background against which the programme of raising installed capacity by the end of the second plan to 6.8 million kW has to be considered. Of the increase of 3.4 million kW between 1955-56 and 1960-61, 2.9 million kW will come from the public sector, 200,000 kW from electricity supply companies and 300,000 kW from industrial establishments which generate their own power. In the public sector hydel power will account for the addition of 2.1 million kW and thermal power for 800,000 kW. In all 42 power generating schemes (new schemes and extensions to existing power stations) will be undertaken during the second plan. These will include 23 hydro-electric and 19 steam power stations. During the next five years per capita consumption of electricity is expected to increase from 25 to 50 units. With the construction of 35,000 miles of transmission and subtransmission lines of voltages of 11 kV and above, the transmission network will be nearly doubled. Energy generation which stood at 6.6 billion kWh before the first plan is expected to increase to 11 billion kWh in 1955-56 and 22 billion kWh at the end of the second plan.

The growth of power consumption is closely related to the growth of industry. From public utility power stations, the industrial consumption in 1950 was 2.6 billion kWh. This rose to 4.6 billion kWh in 1955. It is estimated that in 1960 this will be of the order of 11.8 billion kWh. The proportion of electricity consumed by industries from public utility power stations has increased from 63 percent in 1950 to 66 percent in 1955, and is expected to increase to 72 percent in 1960.

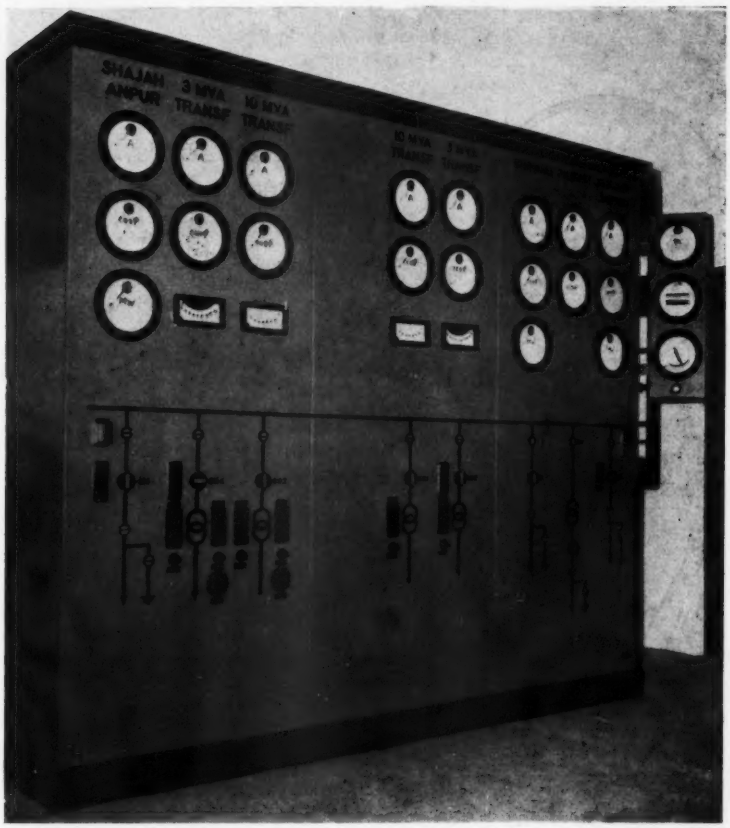
For the development of industry on a decentralized basis and for the progressive use of underground water resources for agriculture, electrification in small towns and rural areas is extremely important. By the end of the first plan about 95 percent of towns with a population above 20,000 have been electrified. The aim in the second plan is to provide electric supply for small towns with population between 5,000 and 20,000 which are centres for the development of the adjoining rural areas. In this group, there are about 4,000 small towns, of which only 40 percent have been electrified so far. During the second plan 80 to 90 percent of these towns are expected to be provided with electricity. Large-scale electrification of the villages with a population less than 5,000 is a difficult problem. There are over half a million of them spread all over the country. Many of these are far away from the developed power resources. With the planning of the various grid systems covering large areas, power supply will be given to an increasing number of villages which lie in proximity to the grid lines. During the second plan electric supply will reach 7,500 towns and villages in addition to those now served. The following statement gives the distribution by population of towns and villages to receive electric supply by the end of the second plan :

Population	*Total number according to* 1951 *Census*	*Number electrified in March* 1956	*Number likely to be electrified in March* 1961
Over 100,000	73	73	73
100,000—50,000	111	111	111
50,000—20,000	401	366	400
20,000—10,000	856	450	816
10,000— 5,000	3101	1000	2600
Less than 5,000	556565	4500	10000
TOTAL	561107	6500	14000

For the successful implementation of rural schemes a large amount of cooperative effort is needed from the people in national extension and community projects and in other areas. With the integrated operation of power systems in urban and rural areas, lower rates for supply of power to rural areas should become feasible.

Flood Control

For a long time flood control was regarded as ancillary to irrigation. The floods which occurred in 1954



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and 1955 have given to flood control measures a distinctive place in the irrigation plan. River commissions have been set up for the Ganga and the Brahmaputra and for rivers in the North-West and in Central India for working out flood control schemes for different river basins. Flood control programmes are coordinated by the Flood Control Wing of the Central Water and Power Commission and at the policy level by the Central Flood Control Board. During the second five year plan special attention will be given to schemes for revetments, spurs and embankments which can be undertaken over a short period and to schemes for embankments and for channel improvements which can be undertaken over the next five to ten years. Long-term measures such as construction of storage reservoirs on rivers and tributaries are being held over for a later period.

Surveys, Investigations and Research

Detailed hydrological investigations for all important river systems will be continued during the next plan. A number of irrigation and power projects included in the second plan have yet to be investigated in full detail. Final decisions on these projects can be taken only after the investigations are completed and the technical and financial aspects become clear. To facilitate progress on this essential work, sufficient financial provision has been made in the plans of the various States and the Centre. A systematic power load survey on a national basis will be made during the second plan. Irrigation programmes also include schemes for research on various basic problems in irrigation engineering. In view of the extensive power development envisaged and to meet the requirements of the electrical manufacturing industry, the plan provides for research on power engineering. The establishment of a Power Engineering Research Institute is also contemplated.

Public Co-operation

Irrigation and flood control programmes provide considerable opportunity for seeking the co-operation of the people. In a vital field of national development there is vast scope for voluntary effort. Few activities undertaken by the Government are so close to the well-being of the people. Labour co-operatives can be and should become one of the most fruitful methods for augmenting rural incomes and increasing employment in rural areas. Through betterment levies the capital cost of projects can be reduced and larger programmes undertaken with the available resources. The economic use of irrigation supplies accompanied by suitable rotations of crops can help expand the areas under irrigation. The effective utilisation of power for small industries will increase employment opportunities and bring real assistance to the artisan and the small enterpreneur.

Annexure

Name of State	*Additional area to be irrigated in Second Plan ('000 acres)*	*Additional installed generating capacity in Second Plan (K.W.)*
Andhra	290	140,300
Assam	Irrigation to be done by minor works	21,500
Bihar	1140	205,000
Bombay	1000	425,000*
Madhya Pradesh	400	193,000
Madras	140	287,000
Orissa	1600	247,800
Punjab	1700	546,000
Uttar Pradesh	1310	302,000
West Bengal	1210	241,500*
Hyderabad	610	75,000
Jammu & Kashmir	120	11,000
Madhya Bharat	300	56,000
Mysore	200	47,600
Pepsu	250	Bulk power from Bhakra Nangal
Rajasthan	1160	72,800
Saura htra	40	50,000
Travancore-Cochin	140	161,000
Ajmer	14	170
Bhopal	12	5,000
Coorg	3	Bulk power from Mysore
Delhi	21	Bulk power from Bhakra Nangal
Himachal Pradesh	20	3,100
Kutch	36	6,300
Manipur	Irrigation to be done by minor works	340
Tripura	-do-	400
Vindhya Pradesh	68	23,000
Pondicherry	6	Bulk power from Madras
N.E.F.A.	Irrigation to be done by minor works	1,150
	TOTAL 11850	3121,960**

* Includes major plant additions by Companies in the electric supply industry.

** Excludes the addition of 0.3 million k.W. anticipated in self generating industries.

(*Continued from page* 10)

Irrigation in Madhya Pradesh

and Kashmir 19%, in Mysore 10%, in Pepsu 31% and in Travancore-Cochin 27%. Again, this statistical enunciation brings out only one aspect of the situation. The picture is not complete without reference to the very limited use of the irrigation works in the State. Irrigation in Madhya Pradesh is almost exclusively confined to the Kharif season, no such facilities being ordinarily available for the Rabi crops. The canals run for about three months only in a year.

This State has to make up a great leeway. The organisation of the Irrigation Department as a separate entity in November 1954 is by itself a big step forward. The purchase of about Rs. 2 crore worth of earth-moving machinery and establishment of the Designs, Research and Mechnaical Organisations are some of the steps that are being taken in an effort to build up and modernise the recently constituted Irrigation Department of the State, so that it is properly equipped to tackle the major tasks that lie ahead with reference to the execution of the projects in the 2nd and successive Five Year Plans. Officers have been sent to the Central Water and Power Commission, and to the Refresher Course at Roorkee University, and other projects and Research stations to acquire the modern technique of irrigation design and construction. It is hoped that before long irrigation will play its due role in raising the standards of living of the common man of the State which are at present amongst the lowest in the country.

Fifth World Power Conference, Vienna, 1956 —Technical Programme

The Fifth World Power Conference will be held in Vienna, Austria, from 17th to 23rd June, 1955.

The Austrian National Committee has been entrusted with the task of organising the Fifth World Power Conference. With the concurrence of the other national committees. The subject "*World Energy Resources in the Light of Recent Technical and Economic Developments*" has been chosen as the main theme of this plenary meeting.

The programme has been drawn up so that, despite the great variety of topics under this theme, the Conference will be able to survey comprehensively the chief trends and the present state of development in the production and use of energy. The Conference will in this way be able to achieve its principal object of bringing about a better understanding among the experts of the various sations.

The technical advances that have been made in recent years in exploiting known energy resources and in developing new ones are great and in some instances outstanding. They present new prospects of producing and using power that may greatly affect future economic and social conditions. World-wide and comprehensive ideas will provide a further stimulus towards power economy.

The value of the Fifth World Power Conference will depend largely on the extent to which probable developments in the future, particularly the immediate future, are discussed, with special reference to those likely to assist materially in solving the various problems of economic production and use of energy. Historical surveys should be restricted to subjects of general interest that have so far received little consideration in technical literature, as for example the inter-relationships between progress in energy production and utilisation and in general industrial activity and economics. Subjects specially within the purview of such other international organisations as "CIGRE" and "International Commission on Large Dams of the World Power Conference" will be excluded.

Technical Programme

The items comprised under the main title "World Energy Resources in the Light of Recent Technical and Economic Developments", are classified into main Divisions I to V and into Sections A to O.

The explanations given for each division and section are merely intended to provide a general idea of the individual items. The occasional references to features of special interest are not to be regarded as limitations of the subject but as providing suggestions.

A more detailed sub-classification of subjects has been avoided because a programme with a too strict classification is not compatible with modern tendencies towards closer inter-relationship in methods of production and use of power. One of the main objects of the Conference is to ascertain what problems are now of greatest general interest. This objective is best achieved by allowing a free choice of subjects within the divisions and sections enumerated. After papers have been received, further division of sections will be made, if necessary, so as to ensure a complete and well-balanced discussion of all the papers submitted to the Conference.

Division I : The State and Development of Power Production and Utilisation in Individual Countries

Section A : Statement and Statistical Review of Developments since 1950

In the general interest each National Committee should provide a report on the present state and the prospective development of the production and use of energy of its country so as to provide a firm foundation for the work of the Fifth World Power Conference.

These statements should as far as possible follow the lines of the corresponding reports given to the Fourth World Power Conference in London. They should contain :

1. A survey of the extent of the proved and probable resources of energy (for example, proved and probable coal resources), indicating not only the amounts but also the technical and economic value of the resources (for example, the total, the technically exploitable and the economically exploitable coal resources). The principles on which the assessments are based should be indicated and special attention should be paid to changes in the assessment of energy resources in recent years (since 1950) ;

2. A review of the extent to which energy resources are being used and of the progress achieved in developing new resources of energy during recent years (since 1950). An assessment of future development should be provided, indicating the factors likely to have the greatest influence on the developments. It is desirable also to give information about characteristic seasonal fluctuations in the production of power.

Section B : Reports on the Methods of Compilation and Use of Statistics

Increasing use is made of statistical information in reaching decisions on energy problems. Even in the same country, however, opinion differs on the scope

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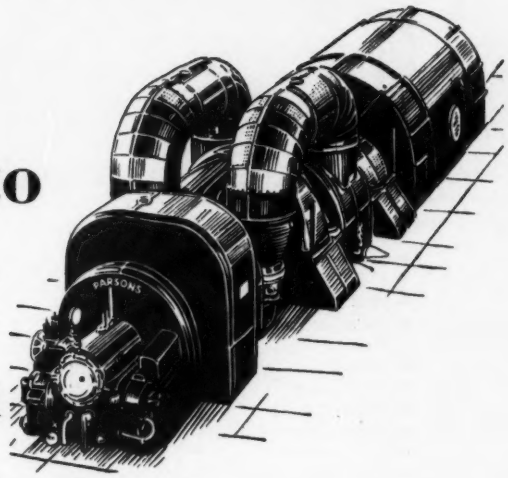

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Bombay	40,000 K.W.	Madras	4,000 K.W.

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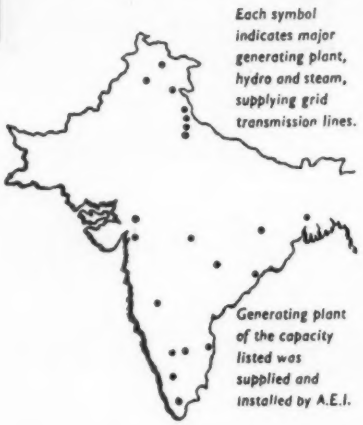
Kashmir	6,000 KW
Jogindarnagar	48,000 KW
Greater Calcutta	1,61,000 KW
Madras (Basin Bridge), Pykara, Mettur, Papanasam and Moyar	2,15,450 KW
Mysore (Jog)	48,000 KW
Travancore	22,500 KW
U. P. (Harduaganj), Bahadrabad, Bhola, Sumera & Muhammadpur	40,600 KW



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and applicability of statistics, quite apart from the fact that the statistics of energy production and consumption in different countries are not on the same basis and are not directly comparable.

Whereas the reports in Section A are to be descriptive, contributions to Section B should deal with fundamental problems of energy statistics, with the object of improving and co-ordinating international data. The reports submitted may deal with statistical procedures to determine either:

1. the magnitude of energy resources (for example, the use of statistics in hydrography for determining natural water-power resources) ; or
2. trends of developments in producing and using energy, especially in forecasting future demands.

Division II : The Preparation and Conversion of Fuels

Fuel technology has made considerable progress in recent years. The reports submitted to the Fifth World Power Conference on present and foreseeable means of preparing and converting primary fuels should stimulate a more rational use of energy resources of great importance in world economy.

In conformity with the usual sub-division according to the natural state of the primary fuels, the subjects of this division are divided into

Section C : The Preparation and Conversion of Solid Fuels
(predominantly coal)

Section D : The Preparation and Treatment of Liquid Fuels
(predominantly petroleum)

Section E : The Preparation and Treatment of Gaseous Fuels
(predominantly natural gas)

Progress in preparation and simple up-grading (for example, the briquetting of solid fuels and the production of smokeless solid fuel) and in the improvement of fuels by converting the primary fuels (for example, the liquefaction and gasification of soild fuels, which have been achieved in recent years by various methods) should be reported on. Advances in the technology of the chemical and metallurgical industries have made possible the development of new methods of conversion. In this field, special attention should be drawn to efforts to obtain the integrated production of synthetic chemicals, of gas for heating, and of electrical energy. With the advances in methods of producing oxygen the possibilities of obtaining high-grade blast furnace gas in pig-iron manufacture deserve attention.

Section F: Economic Requirements for the Establishment and Operation of Long-Distance Gas Supply Systems

An expansion in the production and use of gas and the construction of long-distance gas grids branching in all directions have greatly stimulated the treatment of fuels. The first long-distance gas grids came into being chiefly because consumers for a local excess of natural gas or coke oven gas had to be sought at a great distance. Recently, however, long-distance gas grids have been developed that could not depend on a local excess of gas but for which the gas was specially produced, for example by the complete gasification of low-grade coal. The economic points of view to which attention must be paid in establishing and operating long-distance supply installations for gas from various sources are therefore of growing interest.

Division III : Utilisation of Primary Sources of Energy

The producton of electrical power is of special importance in the utilisation of the primary sources of energy, and for this reason its problems are the chief object of the studies within this division. Sources of energy such as the heat of the earth, and solar energy used directly, should be considered as means of turning heat of useful account in order to save fuel.

With reference to power stations, recent improvements in design, construction and operation should be reported on in so far as they determine the direction of further developments. Among these developments especially those should be dealt with which are influenced by the advances in integrated systems and in automatic control.

Section G : Thermal Power Stations

Among thermal power plants developed for the most diverse primary sources of thermal energy, those of the greatest interest are :

1. steam-driven power-plants ;
2. internal combustion engines ;
3. gas-turbines and jet engines ; and more recently also :
4. other plants (for example fuel cells, hot air engines) ; and especially :
5. plants for integrated processes.

These integrated processes, in which various kinds of heat engines are combined to form a single unit (for example the combination of gas turbines with steam boilers for the utilisation of waste heat, with exhaust turbines connected to them, or the combination of super-charged internal-combustion engines with gas turbines for the utilisation of the exhaust gases) deserve special attention because of the high efficiency attainable with them.

Section H : Hydro-Electric Power Plant, Including Tidal-Power Plant

In addition to the advances achieved in the construction of hydro-electric power plant, great importance is attached to the need to exploit water resources as completely as possible by integrating the demand for water for power with other water interests by a constructive compromise in the form of equipment serving several purposes.

Section J : Atomic Energy

It is in the field of atomic energy that the most marked progress has been made since the Fourth World Power Conference. Since then atomic energy has reached the point of practical application in power production. It is expected that it will provide the strongest impetus to future technical and economic developments. Reports on the technical problems of designing and operating reactors for producing electric power and the discussion of problems concerned with making them economic will receive the greatest attention.

Section K : Other Sources of Energy

Progress has also been made in the utilisation of a number of other natural energy resources. Examples are plants for utilising the energy of the winds, the direct utilisation of solar energy, the utilisation of the heat of the earth and of steam from the earth, and of differences of temperature in the seas. This progress already makes it possible to assess to some extent the practical value of these natural resources, or at least it gives rise to the hope that they may be used to a greater extent within a reasonable time.

Division IV : Purification of Waste Water and Waste Gas in the Production and Use of Energy

The pollution of waters by the discharge of waste liquors from large fuel and power undertakings such as coal washeries, coke ovens and gasworks, and air pollution by smoke, gas and grit and dust from thermal power stations call for comprehensive combative measures. The importance of the problems of purifying waste waters and waste gases from power plants has increased greatly with the advent of atomic power stations. For this reason this subject should not be treated jointly with the plants themselves and therefore only incidentally, but comprehensively in this division, which is provided specially for it. The reports submitted will be divided into two groups, according to whether they are concerned with pollutants in waste liquids or carried by waste gases. They will be considered in—

Section L : Purification of Waste Waters

Section M : Purification of Waste Gases

Division V : International Collaboration in the Production and Use of Energy

The development of energy resources has reached the position that makes international collaboration essential. In addition to international trade in solid and liquid fuels in recent years international systems for electric energy and gas supply have been developed. The rational utilisation of water power is in many instances dependent on the collaboration of all or several of the countries having territory in the catchment areas of the rivers in question. Projects for exploiting atomic energy also have an international basis. The problems of international co-operation are of great importance for the future development of the production and utilisation of energy in its technical and economic aspects.

Among the diverse issues raised by international collaboration in the production and use of energy, only the technical and economic problems come within the scope of the Fifth World Power Conference. The technical consideration of subjects under this heading will be dealt with in.

Section N : Technical Aspects of International Collaboration in the Production and Use of Energy

Technical measures that have already been planned or executed, suitable for promoting collaboration in the production and use of energy on an international footing, should be described. Efforts to standardise the relevant technical specifications or the classification of fuels, for example, should be reported on.

Section O : Economic Aspects of International Collaboration in the Production and Use of Energy

This section deals with the mainly economic considerations of the subject. The long-term advantages to those taking part in such collaboration should be exemplified by definite examples. The difficulties in the way of intensifying international collaboration should be indicated and suggestions for overcoming them should be put forward.

Enquiries

All enquiries regarding the Conference should be made at the office of the Austrian National Committee, Schwarzenbergplatz-1, Vienna-1, Austria.

NOTES & NEWS

An agreement to ensure close co-operation and mutual assistance between the United Kingdom Atomic Energy Authority and the Indian Department of Atomic Energy in the promotion and development of peaceful uses of atomic energy has been concluded.

Announcing this, the Department of Atomic Energy said that the agreement provided for the U.K. Authority and the Indian Department to arrange for members of their staffs to consult and work together on mutually agreed topics.

The agreement is the result of discussions between the U.K. Atomic Energy Authority and the Indian Department of Atomic Energy.

The press note says : Discussions between the United Kingdom Atomic Energy Authority and the Indian Department of Atomic Energy have led to the conclusion of an agreement, which ensures that there shall be close cooperation and mutual assistance between the authority and the department in the promotion and development of the peaceful uses of atomic energy. The agreement provides for the authority and the department to arrange for members of their staffs to consult and work together on mutually agreed topics.

In furtherance of this agreement, the United Kingdom Atomic Energy Authority will provide the Indian Department of Atomic Energy with the enriched uranium fuel elements for the swimming pool reactor, now under construction at Trombay.

The agreement also includes arrangements for the authority to assist in the design and construction of a high flux research reactor which may be built at a later date.

Irrigation in Madhya Pradesh

By

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Chief Engineer Irrigation, Madhya Pradesh

AUTHOR

Irrigation in Madhya Pradesh owes its origin to the recommendations of the Irrigation Commission in 1901-1903. This Commission was appointed in pursuance of the suggestions made by the two Famine Commissions, one set up in 1898 and the other in 1901.

The Irrigation Commission was of the view that although the total amount of monsoon rainfall in the province was usually sufficient, yet it was seldom satisfactorily distributed and was particularly liable to fail in the all important months of September and October, and in the latter month it was invariably insufficient for growth of better qualities of rice. The Commission, therefore, concluded that the principal value of irrigation would be to correct irregularities in the distribution of the rainfall and especially to supplement deficiencies of the late rains. It was anticipated that some of the advantages which would be secured from the introduction of Irrigation were :—

(*i*) A large increase in the production and, improvement in the quality of rice.
(*ii*) The introduction of the better and transplanted kinds of rice to replace the inferior and broadcast varieties.
(*iii*) The cultivation of a second crop in areas where it could not be grown without irrigation.

During the course of their enquiries, the Irrigation Commission recommended to the Government of India that immediate steps should be taken to ensure early completion of certain irrigation works in the province, some of which had been partially constructed as relief works during the famine of 1899-1900. The Commission also proposed that a sum of Rs. 300 lakhs should be spent to provide irrigation for an area of 4,50,000 acres. These works were meant primarily to be an insurance against famine. Accordingly an organisation in the form of an Irrigation Circle was set up in 1902, which, as a result of increasing activities, grew into the Irrigation Branch of the P.W.D.

The construction of Irrigation works proceeded and by the end of 1927-28 a sum of Rs. 640/- lakhs or more than double of that was contemplated by the Irrigation Commission, had been spent on the construction of 139 irrigation works. This was expected to increase to Rs. 751 lakhs for eventual completion and to provide protection to 8,00,000 acres of rice and 2,000 acres of rabi and perennial crops.

But in view of the slow development of irrigation, the State Government in 1927 appointed a Committee to examine and report on the entire question of irrigation in the State. This Committee held an exhaustive enquiry and submitted their report in 1929. One of the most important of their recommendations was that no new works should be undertaken on any appreciable scale until the Government was satisfied with the development of and the return received from the works already constructed.

As a result of this recommendation all new construction works were stopped and the Irrigation Branch of the P.W.D. was abolished in 1932.

Consistent with the above policy of the Government, during the period 1932 to 1943, neither construction of any new work nor original survey was taken up. The surveys which were in progress were left incomplete. By that time 34 major works including the Mahanadi and Wainganga Canal Projects, 87 minor tanks, and 52 villages tanks had been completed, and all these works were serving an aggregate area of about 9 lakh acres. Besides, about 7 lakh acres were also irrigated by private tanks. Thus, in all about 16 lakh acres of land had been brought under irrigation in the State.

After the cessation of World War in 1945, construction of 3 irrigation tanks, viz., Murumnalla, Chichbund and Aree was taken up as part of the Post-war Development Works. Completed at a cost of Rs. 50 lakhs these three projects are serving an area of 20,000 acres.

While the above works were in progress, the rapid increase in population in India and the general world shortage of foodgrains as an aftermath of the war were realised. Consequently, the State Government in 1946 decided to review the irrigation policy of this State in order to consider the desirability of constructing more irrigation works and took steps to get the old survey projects reviewed to ascertain their relative merits and utility. Moreover, the Government of India fixed a target of additional production of two lakh tons of food-grains for this province by 1952-53.

Muramsilli Reservoir Syphon Spillway, 1924

Due to certain special ciscumstances it was not, however, found possible to undertake any new work till the constitution of the Planning Commission at the Centre. In 1950-51, India's first Five Year Plan was launched, and 6 major irrigation projects of this State were included in it. These were, Dukrikheda Tank Project in Hoshangabad district, Sampna in Betul, Bargoor in Chhindwara, Dudhawa in Raipur, Gondli in Durg, and Gangulpara in Balaghat. These projects, the total outlay on which was estimated at Rs. 337 lakhs, were expected to irrigate about two lakh acres of land. Subsequently, however, Bargoor Project was not found feasible and, therefore, was replaced by Saroda Project in Durg district. Estimated to cost Rs. 54 lakhs, Saroda Project, when completed, will irrigate about 20,000 acres of land. It is now proposed to construct an enlarged Dudhawa Tank, so as to bring under irrigation an additional area of 2 lakh acres instead of 90,000 acres previously envisaged. Intended to add to the existing irrigation facilities, the completion of the Dudhawa Tank will necessitate remodelling of the present Mahanadi Canal system. It is estimated that this remodelling will cost about Rs. 2 crores. It is expected that by the end of 1956, Sampna, Dukrikheda, Gondli and Gangulpara Tank Projects will be completed and about 35,000 acres of land will thus be brought under irrigation. The work on the remaining two schemes will be carried over to the Second Five Year Plan.

Apart from major irrigation projects, a programme of Minor Irrigation Works under the present Five Year Plan is also being executed. Under this programme the State has embarked upon 40 minor works which are estimated to cost a little over Rs. 2 crores. Of these, 8 projects are almost complete and it is expected that by March 1956, 20 such minor schemes will get completed. As a result of these schemes, irrigation facilities to more than 45,000 acres will be available.

The State Government have recently also laid special stress on investigation of major irrigation schemes in the Western region of the State. Consequently, investigations on 7 major projects, viz., Bor Project in Wardha district, Sukta in Nimar, Nalganga in Buldana, Katipurna and Wan in Akola, Sapan in Amravati and Yellabara in Yeotmal, are in progress. As a result of stage I surveys it has been estimated that these projects, the total cost of which will be about Rs. 9 crores possess a total irrigation potential of two and a half lakh acres.

The Ministry of Food and Agriculture, Government of India, have in co-operation with the Technical Co-operation Mission, also recently initiated a scheme for investigating minor irrigation projects in the region comprising Western parts of Madhya Pradesh and Hyderabad State and Eastern districts of Bombay. Under the scheme, Technical Co-operation Mission will give assistance in the form of 2 or 3 experts and about half a million dollars worth of equipment and machinery. As a first step, rain-gauge and river-gauge stations and discharge sites have been established and further work is in progress.

It is expected that about Rs. 5 crores would be spent on the construction of irrigation works by the end of the last Five Year Plan.

Investigations on several major projects which are scattered all over the State have been started or are about to start. These are Hasdeo Project in Bilaspur district, Pench Kanhan Project in Nagpur, Itiadoh in Bhandara, Vilochana in Chanda, Jonk in Raipur, Bargi in Jabalpur, Purna and Mun projects in Akola and Kuni Project in Yeotmal. Further, Hasdeo, Pench Kanhan and Bargi on the Narmada are not merely irrigation projects but are also intended to generate substantial hydro-electric power. The total cost of all these projects, which at present await detailed investigations has been roughly estimated as Rs. 66 crores. When completed, they are expected to irrigate a total area of about 23 lakh acres and generate 1,50,000 kW of power at 60% load factor.

Which of the projects under investigation will be taken up for construction under the 2nd Five Year Plan will be determined in the light of the availability of funds. This aspect is at present under discussion with the Planning Commission of the Government of India.

The amalgamation of the Irrigation Branch with the Buildings and Road Branch of the P.W.D. in 1932 gave a serious set-back to the development of irrigation in the State. At present the total irrigated area in the State, including that from the private tanks, is 16 lakh acres which constitutes only 5% of the cultivated area and is about the smallest percentage of all the Part A and Part B States. In Madras and Bihar this percentage is 18%, in U.P. and Orissa 23%, in Punjab 28%, in West Bengal 18%, in Jammu

Gangulpara Tank under Construction, 1955

(*Continued on page 5*)

Role of Machines at Bhakra Dam

By

VISHNU DUTT

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AUTHOR

There has been some controversy in the past over the role that machines should play in the economic development of our country. One school of thought has been in favour of the introduction of the new and latest types of machines in various spheres of work. Their arguments are based on the fact that this leads to more efficient, expeditious and economical way of working. There are others, however, who advocate sparing use of machinery in view of plenty and cheap manual labour being available in the country. There is sufficient weight in both the arguments and the sanest course would perhaps be a happy mean between the two. But so far as the construction of the mighty Bhakra Dam is concerned, this controversy has lost its force, and there has been tilting of the scales in favour of mechanisation. The physical conditions prevailing at the dam site coupled with the speed and efficiency with which the work is sought to be completed, have led to more and more mechanisation at Bhakra Dam. It may be said without fear of contradiction that of all the River Valley Projects in India, Bhakra Dam is the most mechanised.

The narrow gorge with steeply sloping sides at Bhakra where the Dam is being built does not permit enough working space for a large number of hands to be employed. Consequently, mechanisation is the only feasible device being resorted to with advantage.

The 680 feet high Bhakra Dam is the highest straight gravity dam of the world. Its various dimensions and the quantum of work involved are so huge that full justice cannot be done to it with manual labour alone. It is estimated that more than 5 million cubic yards of rock have to be excavated for the foundations of the dam which are being laid at a maximum depth of 180 feet below the level of the river. Most of the excavated rocks are too heavy to be lifted by manual labour. Over 5 million cubic yards of concrete, and 40,000 tons of reinforcement have to be placed in the structure of the Dam. It may be pointed out that this quantity of concrete is three times the total volume of all the seven pyramids of Egypt. The quantity of steel that will go in the making of the dam, if used as 90 lbs. rails would form a 300 mile long railway track. Heavy structures weighing several hundred tons have to be lifted and transported from place to place. Virtually mountains have to be moved. No amount of manual labour alone could have achieved all this, in any reasonable time.

Another objective that has led to mechanisation at Bhakra is the speedy execution of the project. This has an importance and urgency all its own. The scheme has an important bearing on the problem of rehabilitation of refugees. The vast power and irrigation facilities likely to accrue from the project will go a long way in rehabilitating lakhs of uprooted refugees. This will restore the lost equilibrium of the economy of this border state. This explains why this was given the top priority amongst the various River Valley Project schemes included in the first Five Year Plan. The days when stately and magnifficient buildings like the Taj and the Pyramids of Egypt could be built over long periods with the help of slave labour are long past. Alas, the magic of Allah Din's lamp which could conjure up things at the mere bidding, is also confined to the world of fairy-tales. The huge machines and plants are their only counterparts in the present age. It is with their help that huge works can be carried out in a reasonably short period. One big crane can lift about a hundred tons of weight which might prove too much even for thousands of people.

There are certain constructional operations at Bhakra which require extreme exactness, uniformity and efficiency such as no human hands can be relied upon to achieve. For example, the strength and stability of concrete depends upon a certain proportion in which the various ingredients i.e., sand, gravel, cement, water and air-entraining agent are mixed. This requires exact weighing and batching of the material and in less than a minute. A batching and mixing plant with automatic push-button arrangement for the weighing, batching and mixing of the various constituents of concrete has, therefore, been set up at Bhakra. Similarly, thorough efficiency is required in the process of grouting which consists of injecting cement slurry under pressure so as to consolidate the rock and render the foundations impregnable to seepage water. The drilling and grouting machines are, therefore, worked with great care and vigilance.

Keeping in view the various factors mentioned above, different types of machines and plants have been employed at Bhakra Dam to carry out various functions. A visitor to Bhakra Dam is surprised to see a large number of different types of machinery working and comparatively a small number of workers only. Work is being carried out round the clock and

Two big cranes hovering the gorge area for placement of concrete

A drilling machine in operation

there are not more than 7000 skilled and unskilled hands.

Three railway trains worked by diesel electric locos are run to carry workers and material from Nangal Township to the Dam site—a distance of 7 miles. Besides, a fleet of 150 vehicles has been pressed into service for inspection of works, transportation of materials and personnel.

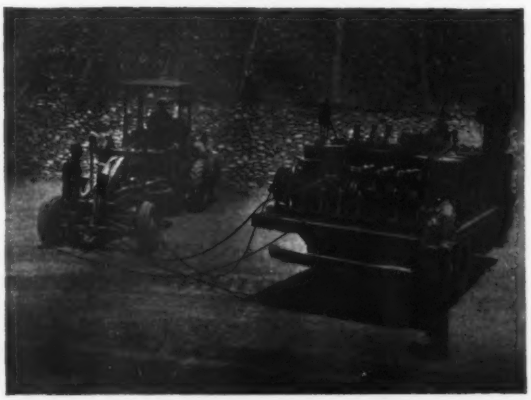
In order to cope with the huge amount of excavation work on the project effectively and expeditiously, the whole operaton has been mechanised. Drilling, blasting, disposal by shovels, draglines, bulldozers and heavy Euclid Trucks is the usual method followed for excavation. Holes upto the required depth are drilled into the rocks with the help of Jack Hammers and pneumatic drilling machines worked by air pressure. The whole gorge area reverberates with the shrill noises emanating from the drilling machines piercing into the rock. Explosives are put in these holes and the required size of the rock is blasted. The blasted material is picked up by shovels and loaded into heavy Euclids which dump the material at suitable places. Bull dozers help in collecting and pushing the blasted material within easy reach of the shovels. There are 41 bulldozers, 16 shovels and draglines, and 60 Euclid trucks engaged in excavation work. The shovels are both diesel and electric and their capacity varies from $2\frac{1}{2}$ cubic yards to 5 cubic yards, costing from $2\frac{1}{2}$ lakhs to 7 lakhs of rupees. The Euclid Trucks are worked by diesel and can carry load upto 20 tons. These trucks unload material automatically by raising the body. Thus the necessity of employment of human labour during the excavation operation has been completely eliminated.

Since July 1953 when the excavation work was taken in hand, 45 lakh cubic yards of rock have been excavated on the foundations of the Dam. Besides, 9.28 lakh cubic yards have been done on the Coffer Dams. In addition, 28.18 lakh cubic yards of other subsidiary excavation work for laying of roads, establishment of offices and plants has been completed. Without the aid of machinery, this huge work could never have been completed in such a short period. One shovel of 5 cubic yards capacity is capable of doing the job of 1000 labourers. Each Euclid Truck has the capacity of 200 horses. Thus at the peak activity period, the working of 10 shovels and 50 Euclids symbolised 10,000 men and 10,000 horses working day and night.

Excavation of tunnels is a highly specialised and complicated job. However, with the help of the latest techniques and the most modern equipment, this operation has been rendered very efficient and free from risks. The use of electric delay detonators minimises shattering and overcutting of the rock in the tunnels, as a result of blasting. The blasted material is removed by Rocker Shovels and placed in Euclids, Tourna Rockers, and Dumptors. Besides the two giant tunnels each 50 feet in diameter and half a mile long meant for diverting the river, scores of other tunnels having a total length of over 2 miles have been constructed for various purposes.

Another important work that machines are doing is the lifting and placing of heavy structures, plants and other material. There are 20 cranes of different types engaged in this work. The huge work of raising the 680 feet high concrete mountain is being carried out with the help of cranes. The entire structure of the Dam is hovered round by 2 whirely cranes, having

A machine being greased and serviced at site by a Mobile Lubricating Truck



A team of Euclids Shovel and a Bulldozer engaged in excavation work at Bhakra

Excavation by tractor of timber haulage inclined carriageway

165 feet long booms, one double cantilever crane and 2 Derrick cranes which have already been installed. One more whirely crane and one more double cantilever crane will be put up shortly. These cranes, working simultaneously in co-ordination with each other, lift the concrete buckets and lower them in the required position.

The process of manufacturing concrete required for the dam, has been completely mechanised. An elaborate plant, which is the best of its kind, has been set up for the purpose. It consists of a screening plant where sand and gravel are washed and separated into required grades ; a cooling plant where gravel is cooled down to 43° F before concrete is prepared ; and a batching and mixing plant provided with a push-button arrangement for mixing of the various ingredients that is gravel, sand, cement, water and air-entraining agent in required predetermined proportions. A 4½ mile long belt conveyor has been laid for transporting sand and gravel from the quarries to the screening plant at the Dam site. This is designed to carry 750 tons of material per hour. The entire concreting plant including the belt-conveyor costs nearly 5 crores of rupees and is designed to give ready-made concrete at the rate of 400 tons per hour.

It is evident that maximum advantage out of mechanisation can be drawn, provided the machines remain in working condition and there is least breakdown. Availability of adequate number of efficient and trained personnel to handle the machines is another pre-requisite for obtaining good results. At Bhakra, both these factors are receiving the attention they deserve.

It is a well-recognised truth that the health and energy of human body depends on the right type of food taken at the proper time. Similarly, the working condition of any machine is dependent on its proper upkeep and servicing. Keeping this thing in view, a separate department known as the Lubrication and Servicing department has been set up for the purpose. One of the main functions of this department is to provide sound and adequate fuelling service to the machines. Since large quantities of petrol and diesel oil are consumed on the project, bulk storage installations have been provided near the Dam site. It may be pointed out that the consumption of diesel oil and petrol have been as high as 100,000 gallons and 15,000 gallons per month respectively. Electrically operated fuel dispensing pumps for deisel and petrol have been installed at suitable places all over the working area so that machines and carriers that go by may fill in the necessary fuel supplies. Further, in order to provide on-the-spot supplies to heavy equipment like shovels and tractor dozers, mobile tankers of 1000 to 2000 gallons capacity equipped with pumping sets having flame-proof hoses, have pressed into service. Every care is taken to ensure that only filtered fuel is supplied to the machines.

Another important part played by the Lubrication and Servicing Department is to provide lubrication service to the machines on site. Instead of heavy machines coming upto servicing centres, the mobile lubricating trucks go to each machine. The mobile lubrication units have been fitted with Alemite air operated barrel pumps and hoses on reels to reach all lubricating points of the machine to be serviced.

Since work at Bhakra Dam is carried out round the clock, steps have been taken to ensure that every machine is checked on site once a day for its daily routine maintenance which includes checking up of crankcase oil, radiator water, air cleaner service and the tyre inflation. Proper progress reports of the work carried out are maintained in respect of each machinery.

Suitable facilities for repairs and maintenance of machinery have been provided in the form of several

Electric driven diamond drilling machine in operation

Sheepfoot Rollers and a bulldozer ramming layer of clay on Coffer Dam at Bhakra

field workshops established at convenient places on the dam site.

A big workshop at a capital cost of 40 lakhs has been established at Nangal to cater to the mechanical requirements of the project. Repairs and overhauls of the deisel and petrol driven machinery are carried out in the plant repair and Auto Repair sections of the workshop. Besides, the fabrication of all steel structures that can possibly be carried out in India, are being done in this workshop. The structural shop is capable of fabricating 300 tons every month. So far 12,000 tons of steel have been fabricated.

The type-retreading shop has been playing a very useful role in retreading and recapping heavy and costly tyres of all sizes used on the project. This has resulted in not only keeping the machinery in working condition but has saved the Government about Rs. 2½ lakhs.

The setting up of Oxygen and Accetylene plants in the workshop has gone a long way in ensuring steady supply of gases required for welding. During the two years of their operation, the Government have saved at least Rs. 4 lakhs.

Non-availability of spare parts for replacement is a potent factor in enforced idleness of a machinery. The Nangal Workshop has stood in good stead by making available several of the spare parts required for the various machinery. Due to the manufacturing of the spare parts in the workshop, there has been a saving of over 4 lakhs of rupees.

As a result of the various measures adopted for the repairs and maintenance of machinery, there has been considerable reduction in their sickness and breakdown. It is gratifying to note that since 1954 the average number of working hours of machinery has gone up by over 50 per cent. The reduction in sickness and breakdown during the same period is about 47 percent. In other words, the construction work on the project has gained in speed, efficiency and economy to the same extent.

There is no doubt that there has been considerable shortage of trained personnel for handling the various types of machines. Steps have, however, been taken to train as many new hands as possible. Working on the principle that practical work is the best form of training, many young engineers and technical hands have received their training while working at Bhakra Dam. The presence of a few American experts on the project has been quite helpful in as much as our people have become more machine-minded in general and have learnt to handle machinery like Euclids, cranes, and shovels with efficiency of which they had little previous experience. Besides, a technical training school has been attached to the workshop, for training youngmen as operators and mechanics to be employed on the project.

The giant machines working under the control and guidance of trained workers are playing a vital role in the building of the mighty Bhakra Dam. The machines have come in handy in Man's fight against the rugged mountains and the taming of the wild river. Like the disciplined and well-equipped army, the team of workers at Bhakra Dam is assured of triumph over Nature.

Construction Machinery used at Bhakra Dam

(*a*) Shovels & Draglines	..	16 Nos
(*b*) Emico Rocker shovels	..	4 ,,
(*c*) Tractor Dozers	..	41 ,,
(*d*) Motor graders & Road maintainers	..	5 ,,
(*e*) Euclid Truck carriers	..	60 ,,
(*f*) Euclid Truck mixers	..	6 ,,
(*g*) Euclid water sprinkler tankers	..	4 ,,
(*h*) Water supply distribution tankers	..	4 ,,
(*i*) Diesel tippers	..	8 ,,
(*j*) Tourna Rocker carriers	..	4 ,,
(*k*) Diesel dumptors	..	12 ,,
(*l*) Air compressors	..	12 ,,
(*m*) Diesel electric locos	..	3 ,,
(*n*) Cranes	..	20 ,,
(*o*) Greasing units	..	6 ,,
(*p*) Fueling tankers	..	4 ,,
(*q*) Mack trucks	..	12 ,,
(*r*) Concrete rail cars	..	11 ,,
(*s*) Concrete placing cranes	..	7 ,,
(*t*) Heavy duty trucks	..	65 ,,
(*u*) Light vehicles & Inspection vehicles		63 ,,

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ECAFE
Work on Electric Power

There was no session of the Sub-Committee on Electric Power in 1955. The next session of this sub-committee will be held in March 1956.

Review of Progress

In regard to project 33-01—"Review of progress of electric power development in Asia and the Far East"—, the compilation shows the progress made by the various countries of this regon in the development of electric power stations, and transmission lines, and indicates the electric power situation in these countries during the last two years. In this connection it may be noted that while some countries in this region have set up the necessary organisation for collection, scrutiny and compilation of statistical data regarding the technical aspects—e.g., normal rating and peak capability of generating plant, etc.—and operational statistics of power systems, others are in the process of setting up such organisations. In some of the countries the usefulness and importance of such data for assessing the efficiency of the various parts of the power system is perhaps not sufficiently appreciated. Accordingly, a note indicating some important aspects of statistical data is being presented to the sub-committee at its forthcoming session. Emphasis is being given to the introduction and use in ECAFE countries of international standard reporting methods.

The International Conference on the Peaceful Uses of Atomic Energy was held in Geneva in August 1955 under the auspices of the United Nations ; it was attended by eminent scientists from almost all countries of the world. About 430 scientific and technical papers were presented at this conference on various aspects of atomic energy, e.g. :

(*a*) Prospecting for ores of uranium and fissionable materials.
(*b*) Processing and purification of such ores and fabrication of fuel elements for atomic piles.
(*c*) Metallurgy of special metals needed to stand the high temperatures occurring in some types of atomic piles.
(*d*) A survey of chemical and metallurgical problems arising in the use of energy from atomic fission.
(*e*) Design techniques of different types of reactors.
(*f*) Economics of atomic power in the light of costs of experimental reactors.
(*g*) Likely requirements of electricity and fuel of different countries over the next fifty years, and the role of nuclear energy in meeting the the future requirements of power.
(*h*) Radiological hazards.
(*i*) Waste storage or facilities for disposal of radioactive wastes from atomic reactors.
(*j*) Use of isotopes in medicine and industry.
(*k*) Training of personnel for operation of reactors and for research.

Summaries of all the 430 papers were issued to delegations which attended the above conference. Those members who did not participate in the conference can obtain these summaries from United Nations Headquarters, on request.

Out of the eleven items listed above, items *e*, *f*, *g*, *h*, *i* and *k* are of particular interest to electric power experts of this region, and these items cover approximately sixty papers. Copies of summaries of these papers are being obtained for circulation to members of the Sub-Committee in Electric Power. The papers and proceedings of the conference are also being obtained from Headquarters.

The secretariat proposes in the first instance to prepare a topical paper summarising the status in respect of the development of nuclear reactors for power generation, and to compile information regarding facilities available in some countries for training of personnel from the countries of the region for operation of nuclear reactors and for research. It is also proposed to prepare a bibliography of available documentation on the peaceful uses of atomic energy for presentation to the sub-committee. The secretariat will continue to study further developments on the subject and to bring important developments to the notice of the sub-committee.

With a view to extending the peaceful uses of nuclear energy, several countries have made generous offers to share with others the results of their experiments in this field and to provide technical assistance and equipment. The Committee on Industry and Trade, therefore, may wish to suggest to the governments of the region that they avail themselves, individually or in groups, of any facilities obtainable through the United Nations or through other sources, chiefly with the aim of acquiring more knowledge and also imparting training to a large number of technical personnel in the various aspects of the generation and peaceful use of nuclear energy and products obtained from it such as radioactive isotopes.

Rural Electrification

With regard to project 33-02—"Rural electrification"—, a note giving the outlines of a Rural Electrification Demonstration Centre being constructed in Yugoslavia was circulated to all countries of the region. The secretariat expert rendered advisory services at the request of the Governments of Ceylon and Thailand in the preparation of projects for rural electrification demonstration centres. The demonstration centre for Ceylon will have equipment for processing agricultural produce, some of which will be for the common use of a rural community, e.g. a small rice mill. Equipment will also be installed for small individual processing and manufacturing industries, e.g., a small oil pressing unit, a power loom, etc.

The demonstration centre for Thailand is being planned in a "self-help resettlement" where 5,000 families of farmers are being settled on newly-cleared land. The equipment proposed comprises a corn-shelling and grinding machine, a set of saw-milling machines, a set of eight machines for a carpentry shop, a small oil-mill for ground-nut oil, a small work-shop, a cotton-ginning machine, a small rice mill, a 5-ton ice plant and cold storage and a set of knitting machines. Most of this equipment will be installed in the demonstration centre where the members of the settlement will bring their produce for processing

The respective countries will approach TAA for inclusion of these projects in the United Nations technical assistance programme for the next year. The Committee on Industry and Trade may wish to emphasise the importance of providing adequate technical assistance and equipment in this regard, under the technical assistance programme of the United Nations.

The Committee may also wish to explore the possibilities of utilising the facilities available at such rural electrification demonstration centres for the promotion of knowledge as well as training of personnel from countries lacking such facilities. It may wish specifically to consider measures for joint participation and co-operation by a group of a number of countries in such demonstration centres.

Hydro-Electric Potential

In regard to project 33-03—"Hydro-electric potential of each country of the region and its gross technical and economic limits", a beginning has been made by the compilation of a preliminary report summarising the principles and methods of assessing this potential. Such an assessment requires *inter alia* meteorological data regarding monthly and annual rainfall in each catchment and records regarding the flow of river over extended periods of twenty to thirty years, together with topographical maps of the river basins to as large a scale as possible. Although some countries possess considerable data of some river basins, much work remains to be done to collect data of all rivers to permit a comprehensive assessment of the hydro-electric potential of each country.

The secretariat has reviewed the status of assessment of water-power resources of this region and surveys of water-power resources development have been compiled by the Bureau of Flood Control and Water Resources Development. The purpose of the present project is to assist in the determination of the technical and economic limits of the hydro-electric power potential; the latter depend upon criteria which take into account the cost in each country of available fuels, and the cost of equipment required to generate power with such fuels. It is proposed, for consideration by the sub-committee, that a survey of the work done in this field in each country, for the techniques adopted and of the characteristics of water power resources of each country, should be made at a working party of hydro-power specialists of this region.

It will be recalled that at its last session the Committee on Industry and Trade recommended n allocation of a high priority to the group visit of electric power experts from the region to manufacturers' plants and power stations in Europe. The secretariat is glad to report that TAA has agreed to seek funds for this visit to take place during 1956. A detailed outline of the broad objectives of this study tour and aspects of particular significance to experts of this region has been furnished to TAA. Negotiations with various countries offering facilities for this visit are being carried out by TAA. During this study tour participants will be able to observe some of the latest techniques evolved, as a result of their long experience, by the countries they visit, to increase the efficiency of operation and to improve fuel economy, as well as developments in construction, operation and maintenance practices of power systems permitting an increase in the availability and utilisation of power-system equipment.

Standardisation of Plants, Equipments and Practices

In regard to project 33-05—"Standards for electrical plant and equipment and standardisation of system practices"—, a beginning has been made by the issue of a questionaire to countries of this region to ascertain the present status in respect of (*a*) voltages and frequency adopted as standard in their power systems for generation, transmission and distribution of electric power; (*b*) standard codes of practice developed for over-head distribution lines and indoor and outdoor distribution sub-stations; (*c*) standard specfications evolved in countries of the region and (*d*) what specific standards of one or more European or American countries are adopted in each country of this region for the purpose of plant and equipment for electric power systems. A summary of the replies received will be presented to the Sub-Committee on Electric Power. Member countries are being requested to present experience papers embodying their suggestions for appropriate general standards for equipment and codes of practice for discussion by the sub-committee.

SULZER EXPERT IN INDIA

To assist the authorities concerned in developing the Irrigation and Pumping Schemes proposed under the Second Five Year Plan, Messrs. Sulzer Brothers have posted to India a highly trained Expert in the shape of Mr. Alfred Mooh.

Educated at the University of Lausanne, he graduated both in Mechanical and Electrical Engineering with such distinction that he was retained in the University.

He later left the University and joined the Oerlicon Engineering Co. who, after 2½ years of specialised training, sent him to South America to take charge of their office in Rio de Janeiro.

One of the most interesting jobs he was called upon to tackle was the Water Supply Scheme for Caracas, the Capital of Venezuela. This involved installation of 16 pumps, each with an output of 20,000 gallons per minute at a head of 300 ft., grouped into 4 stations of 4 pumps each to raise water from a river flowing at the bottom of a deep gorge and carrying it through thick forests to the Capital.

Notes & News

Fuller utilisation of U.S. Water Resources under Study

The U.S. Congress has now before it two bills—one in the Senate and one in the House—which concern a little-known California river but which have attracted major attention. The reason : The bills are involved in a gigantic plan to solve a problem that has assumed almost national proportions.

The problem is water. There isn't enough available where it is needed and California is by far not the only state beginning to feel the squeeze.

The origin of the water shortages are as varied as are the states afflicted and the remedies proposed.

In the Southwest there is the "Dust Bowl", formed by parts of Kansas, Colorado, Olkahoma and Texas. There, precipitation comes in periodic cycles of several years' duration. Water supply is severely reduced during droughts and the problem is not one of irrigation. It is how to adjust cultivation to the vagaries of nature.

This summer, experts from the Agriculture Department in Washington, from local agricultural colleges and state governments are together on the problem.

They have already determined that at least 20 per cent of the area now cultivated for wheat must be made into pasture again. When that is done, grass will hold the soil in place and help protect the whole area from wind erosion during droughts. Just now, experts and farmers are about to decide which plots may be planted for wheat and which must become pasture.

An entirely different water problem has begun to beset the south-eastern farm belt, with tobacco, cotton, peanut and rice fields stretching from Louisiana northeastward to Virginia. Farming has become so intensified that even this rain-blessed region is resorting to irrigation as a supplemental form of watering. These new water problems have now led several southern states to adopt "water codes" by which priorities for residential, farm and industrial use of water can be set up and adjudicated.

In class by themselves are the 17 western states, where farming depends almost entirely on irrigation. In the region as a whole, there is no water deficit. Yet this problem remains : to get the water from where it is to where it is needed.

In practice, the solution is not always simple. In mountains Utah and Colorado and in the northern part of the coastal tier, distances to be covered by pipes and irrigation ditches are within reason. Not quite so in California, the "golden" state. It has acquired its fabulous productivity strictly by virtue of dams, pumping stations and virtually thousands of miles of irrigation ditches, fed by mountain rivers and underground wells.

But of late, with population and industry rapidly expanding, spreading farms and burgeoning cities have been a severe drain on water supply. As a result, California's underground water level has been dropping at an alarming rate—as much as 25 feet a year—with wells running dry and acres lying fallow. New water supplies must be harnessed.

This is the specific problem for which solutions are proposed in the two bills now before Congress. In both instances, the northern California Trinity River is the source of water. But the bills differ as to financing (state or federal) and especially as to the technical details of making the Trinity part of the far greater Feather River project.

Most likely is some sort of compromise. It would start with the less-ambitious Trinity project and yet pave the way for the Feather River Project, the most ambitious so far attempted in the United States.

As worked out by the California state government, the project would cost $1,500 million and construction would take 20 years. A dam half again as big as Grand Coulee (now the world's largest) would store enough water to supply 20 million people for one year. A system of pipes, ditches and pumps, partly provided by the almost-completed Central Valley Project, would lead the water southward, then lift it to a point 3,300 feet up the Tehachapi Mountains near Los Angeles, through a 10-mile tunnel, to let it tumble down on the other side of the mountains as far south as the Mexican border, a total distance of close to 1,000 miles.

A project of such heroic proportions would free central and southern California from the fear of having their rapid development stunted by lack of water. It would encourage other states to undertake ambitious projects. And it would epitomize man's struggle for nature's most basic and most precious gift.

Geological Survey on Underground Water Resources in Israel

The first scientifically based estimate of the subterranean water resources of Israel's coastal plain from the edge of the Gaza strip to Tel Aviv will now be possible following the completion of a basic geological survey carried out over a number of years by the Geological Institute attached to the Ministry of Development. The survey of the area stretching north from Tel Aviv to the Carmel range will be completed during the coming winter.

On the basis of the data contained in this report a comprehensive plan for the rational and controlled exploitation of these waters will be worked out. This plan will avoid the dangers of overpumping, and will ensure an even distribution of underground waters throughout the area.

Three New Coles Cranes

Incorporating several new features, and designed to lift a load of 25 tons at 10 ft. radius, are three newcomers to the Coles range of mobile cranes, built by Steels Engineering Products Ltd., of Crown Works, Sunderland and distributed by Tractors (India) Ltd.,

Flexibility of operation is an important feature of all Coles cranes which have proved popular in a wide variety of industries, including iron and steel, engineering and ship-building, building and civil engineering, and petroleum, as well as on docks, and for other loading and transport jobs.

The new cranes are a self-propelled, a lorry-mounted, and a rail version of a model known as the 2710 ; the letters "S", "L" and "R" respectively identifying the cranes. Much of the equipment and features are common to all three—the principal item being the well-proved Coles system of diesel/electric or petrol/electric transmission. This system incorporates separate electric motors for the crane motions of hoist, derrick and slew, and on the rail and self-propelled cranes for travelling. A chassis-mounted diesel engine powers the lorry-mounted crane for travelling.

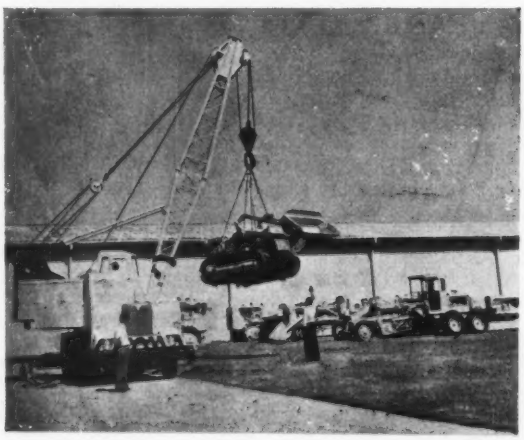
Smooth and precise control on all crane motions is provided by the Coles Transmission System. The simple layout of the grouped finger-tip controls in the operator's cab also ensures a minimum of operator fatigue. Automatic self-resetting limit switches, which prevent the operator from hoisting or derricking beyond the prescribed limits are fitted to all models. Hoist, derrick and slew motions also have electro-mechanical brakes which are applied automatically in the event of any power failure.

The cranes have a full range of standard equipment including a toolbox, electric starter and horn, head, side and tail lamps, illuminated instrument panel, and jib headlamp. Safety glass opening windows are fitted in the operator's cab.

A 30 ft. strut jib of lattice construction is fitted to all the cranes, and this can be extended to a maximum of 80 ft. An optional item of equipment for all models is a 20 ft. fly jib.

The S2710, or self-propelled model, offers a choice of power units. They are a Ford petrol engine, giving 64 h.p. at 2,200 r.p.m., or a Perkins diesel engine (65 h.p. at 2,200 r.p.m.) The power unit drives a specially-designed variable voltage generator which in turn powers the hoist, derrick and slew and travel motors. Automatic reversing mechanism on the steering gear is an important Coles feature on this crane. The mechanism gives "correct" steering no matter what the position of the operator's cab in relation to the chassis and wheels of the crane. Foot-operated air brakes act on the four rear wheels of the crane, which also has a mechanical handbrake.

Included among the optional equipment available is an audible and visual safe load indicator; a single hook for faster hoisting of light loads ; single or twin free running hoist drums ; power-assisted steering ; and a heater or fan for the cab. Grabs or magnets can also be supplied for the crane.



The L2710, crane is mounted on a Coles 6×4 crane carrier chassis. An A.E.C. diesel engine is used for travelling and gives a maximum road speed of 27.3 m.p.h. Power assisted steering is a standard feature, and air pressure foot-operated brakes are fitted on all wheels. A main gearbox has five forward speeds and one reverse, and an auxiliary gearbox is also fitted. A six-wheel drive chassis can be supplied if the crane is to be used on undeveloped sites or for considerable cross-country work. On the crane itself there is a Perkins diesel engine (65 h.p. at 2,200 r.p.m.) driving the generator which powers the hoist, derrick and slew motors. The full range of standard equipment available on all models is fitted, and the optional items are also available. An important feature of this model is a removable tailweight. Hydraulic equip-

(*Continued on page* 20)

Our Delhi Letter

(*From our own correspondent*)

The key problem of the attainment of targets in River Valley Projects continues to be technical engineering personnel. Howsoever one may approach the problem, the shortage becomes prominent and supply and demand position reveals a big gap. Actually both the Public and the Private sectors have to be taken into account. When there is a chronic shortage even in the public sector, how much worse the position would be in the private sector where the stability of one's job is always doubtful.

Planning Commission examines problem of technical personnel

The Engineering Personnel Committee of the Planning Commission are deliberating over this matter. A broad pattern of requirements has been examined. The one lesson that emerges from their recommendations is for augmenting of training facilities. The Third Five Year Plan has also to be kept in view while stepping up the strength of personnel. In spite of the training facilities that exist, shortage of engineering personnel in all categories may be taken for granted. The Committee have recommended that the shortage should be made up by utilising engineers who are at present unemployed, promoting Graduates working in subordinate positions, promoting diploma holders who have manifested their ability to assume higher responsibility, working engineers who are in the saddle to carry a heavier load, and finally to retain persons for suitable period beyond the age of superannuation subject to their physical fitness.

Allied Personnel

An important point to note is that not only is there a shortage of engineering personnel but the allied branches of accounts, technical correspondence and technical stenographic work also call for special steps. The engineer can only work efficiently if his other collaborating services, e.g, accounts, technical correspondence, etc., cope with the speed. Since this point is usually overlooked by committees, it is just as well to bring home its importance.

The haphazard movement of personnel from project to project leads to undesirable consequences. The men remain worried about their future and are always pre-occupied with writing representations for transfer. Key personnel leave the project before its completion causing grave dislocation. Each project authority offers better terms for fresh recruitment which causes unhealthy competition.

Central control needed for training and selection

All the above difficulties indicate the desirability of common agreement and arrangement between all States through a Central organisation for the successful execution of projects.

No scheme of planning would be sound unless it makes a proper provision for training of personnel. This points out the great necessity for making the instruction in engineering and accounts to be high class, which again means better teachers employed on better salaries. Refresher Courses are the other necessity.

The strengthening of State and Centre cadres of engineers in practice and in instructional duties is urgently called for. Since India has emerged out of a Police State set-up into a welfare State ideology, the very best men needed to be attracted to technological careers. For this purpose, the incentive which is inseparable from better wages and more security of service must be offered.

Institution of Engineers Annual Meet

The Institution of Engineers (India) are meeting during the 3rd week of February at Punjab's modern Capital—Chandigarh. This organisation has elected the Punjab as its venue evidently due to the Bhakra Nangal Project and Chandigarh Capital construction. In the agenda of discussions due regard has been given to all branches of engineering. The organisers are to be congratulated on the arrangements which are contemplated. Considering that in modern countries the engineering societies wield a most important influence in determining technical trends, the Institution of Engineers are a pioneer body of unrivalled importance in the agencies contributing to the development of this country. When engineers from all parts of this sub-continent visit Chandigarh, Bhakra Dam, Nangal Hydel Canal and Nangal Powerhouses, they will be struck by the grand scale on which these works have been conceived and executed. It is only in such gatherings that the best criticism comes out. It will be indeed most gratifying to those responsible for these projects to obtain the informal views of their brethern who are engaged in similar works in their own regions.

Bhakra Dam

Doubtless, the Bhakra Dam will be visited. It will reveal the working of the biggest mass concrete production factory which has ever been set up in the world. Already the Bhakra Dam is being built bucket by bucket, each bucket of 4 cubic yards arriving in place within a brief interval of 3 minutes. Block by block, the Bhakra Dam has started to rise and as months and years pass it will gain the shape of a completed structure which has been visualised so long in the dreams of the foremost engineers of the Punjab.

Kotla Powerhouse

Quite close to the Bhakra Dam and on the Nangal Canal, Kotla powerhouse will be seen under erection. This powerplant is a duplicate of one at Ganguwal which was commissioned in January, 1955. The people of the region are waiting for Kotla to go into commission as all the juice expected from this powerplant is already earmarked for industries in the public and private sectors. It does one's heart good to see that except for one or two foreign Specialists, the entire work is being done by Indian personnel, and the foreign specialists are quite convinced of the high degree of proficiency which has already been attained by the Indian personnel in the erection of heavy electrical units. This training augurs well for the giant Bhakra plant which will be the further addition to the generating capacity from the Bhakra Nangal Project.

Bhakra Power Plant

The Bhakra generating units comprising Francis Turbines of 125,000 horsepower and alternators of 90,000 kW, have at long last been ordered from Messrs. Hitachi of Japan and Messrs. A.E.I. of the U.K. With the placing of these orders the schedule has been firmly set for the construction and completion of the left powerplant so that it may deliver juice towards the end of 1959. This powerplant is going to be the biggest in Asia and in its technical problems it can compare with the biggest anywhere in the world. The Bhakra Dam Designs Directorate are charged with the civil designs and the work of construction is being done jointly by the Bhakra Dam Administration and the Electricity Department of the Punjab.

Fertiliser-cum-Heavy Water Factory

Side by side with the Bhakra Powerplant the project of the Fertiliser-cum-Heavy Water Factory is beginning to take shape. Consultants from France, America and U.K. have been giving their advice to the Fertiliser Project Committee for making a preliminary project estimate. It is expected that orders for the equipment required for manufacture of Heavy Water and Ferliliser must be placed within one year if the project is to keep pace with the Bhakra Dam construction. As soon as the factory is put up about 160,000 kW of firm power will be utilised on this project. It is expected that the Bhakra Nangal Project authorities comprising the States of Punjab, Pepsu and Rajasthan will be earning an early return on the huge investment of their expanding project.

Khatima Powerhouse Damage

The news that Khatima Powerhouse showed signs of a failure due to subsidence caused by pumping has sounded a note of warning to all technical organisations. It is understood that the damage is not at all serious and it will not materially effect the durability or efficiency of the powerplant. But even a temporary dislocation is a matter of anxiety and it indicates how close the collaboration between the civil and the electrical engineers must be, in order to safeguard their plants from all points of view. It is a well known maxim in engineering that every failure gives vital lessons for improvement in design and construction procedures. The Khatima failure is also to be regarded in this light and attempts must not be allowed to set up a vicious circle to find someone to blame. Very often these failures are the result of intangible causes which cannot be located by the persons who are incharge of the project at the time. A scientific and objective attitude is necessary if the morale of the workers is not to be adversely effected.

Technicians needed in top Administrative positions

At this juncture in the country's planning and execution of River Valley Projects, it becomes very necessary that the government give the fullest opportunity to technical people to associate themselves in the administration of the projects. If administration is entirely left in the hands of non-technical people, it is not fair to them because by their very qualifications and experience they cannot give the final word in border line technical controversies If technical people are co-opted from the very start in the technical and administrative problems they can give the benefit of their very long experience and many pitfalls can be avoided.

It has recently been mentioned by eminent representatives of technical organisations that modern countries are already putting engineers in their top policy-making and administrative positions In China and Russia, it is said that Ministers incharge of the portfolios of Power, Irrigation Housing etc. are Engineers. Is it not possble that this practice be also followed in India where the need for development is now uppermost.

While the above claim is put forward, the engineers must also realise that their own capacity to handle administrative and policy problems must also be beyond doubt. For this purpose it is high time that training is imparted to selected engineers in the matter of administration At the Water Resources Training Centre to be shortly opened at Roorkee, there is a proposal for persons of Superintending Engineers' rank to be trained in administrative matters. This is a very welcome step because no matter how perfect a technical solution may be it is liable to be wrecked if the administrative side is not also correct.

(*Continued from page* 18)

THREE NEW COLES CRANES

ment can be supplied to remove the weight without outside assistance. The total weight of the complete vehicle can be reduced by four tons to 26 tons when the weight is removed, an important consideration for countries which limit the weight of vehicles using public roads.

Third of the new models, **the R2710 crane**, offers the same choice of power units as the self-propelled crane—the Perkins diesel (65 h.p. at 2,200 r.p.m.) or the Ford petrol (64 h.p. at 2,200 r.p.m.). Mounted on eight single flange steel-tyred wheels, the crane has air pressure foot-operated shoe brakes fitted to all wheels and a handbrake is also fitted. The crane has similar specifications to the self-propelled model, being fully-equipped, but in the list of optional equipment are two important items—railway type spring buffers and derailing beams.

The Second Plan

The first Five Year Plan period is now concluding and we are entering the second stage of development. It is already known that the First Plan targets have been more or less achieved, although some of them were modest. As we had pointed out earlier, the first plan was only a preparatory one to be followed by a regular and thorough plan of economic development of the country. The Second Plan, which has now been published in the draft form, fully justifies this expectation. Being a Journal devoted to only a specific aspect of development, it does not propose to deal with this draft exhaustively in all its aspects. Therefore, only very brief comments will be made on the plan generally. Although the Second Plan has been in preparation for a long time, it has not developed as a result of as much public participation as we would have wished. It is true that a large number of economists, administrators and important legislators have contributed to its formulation. It is also true that local and district development committees have made concrete suggestions regarding specific and local projects. There has also been a general discussion in the country on the Plan Frame prepared by Professor Mahalanobis. But the latter was on such a level that the educated laymen got more confused than before. All this process, it must be admitted, has not led to a greater degree of comprehension and sense of participation in the minds of the intelligentia. In our opinion, what was necessary at the very outset was to help the intelligentia throughout the country to think out the broad outlines of a national plan by placing before them in simple form our present economic situation, our resources and our requirements and needs, and then to ask for their opinions on major questions of policy. In this manner they would have discussed the plan in the larger context of the whole country rather than only in terms of localised projects and thus would have developed a national outlook as against the parochial that is so prevalent in the country today. However, we hope that at the time of the formulation of the third plan this approach would be given a fair trial, basically with the idea of educating the public and creating a sense of participation in the formulation of the plan.

The entire Second Plan is based on the conception of "the socialist pattern of society" which has been defined as : "The basic criterion for determining the line of advance is not private profit but social gain" (page 9). The term "social" can be conceived in either the collectivist sense or in the sense of the totality of actual individual gains. The Plan is not very clear on this score as to where the actual emphasis lies. Who will determine this "social purpose"? The "progressive reduction of the concentration of income, wealth and power" is a good objective, but will this reduction take place only in relation to individuals *inter se*, or will it also be between the individual and the State ? The plan further takes a very benevolent and paternalistic attitude when it says that "the state has to take on heavy responsibilities as the principal agency *speaking for* and *acting on behalf* of the community as a whole". This is a conception which is very far from the idea of co-operative commonwealth.

The Second Plan admittedly lays emphasis on industrialisation. To a great extent this was inevitable for an underdeveloped country. But we are not sure whether such a tempo of industrialisation without a parallel and balancingly proportionate development in agriculture and social services would continue to maintain healthy political and economic life in the country unless large scale assistance is received from abroad. In case the latter does not materialise, the country will go through a period of great strain and tension which will put the democratic experiment to a severe test, and in the background of the general authoritarian mentality it is quite likely that the State may develop totalitarian tendencies.

In the specific field of irrigation and power, it is evident that, although the total allotment is more than in the previous plan, the emphasis is on medium-sized projects. Why the large projects have not been taken up in the same tempo as before has not been fully explained. Possibly investigations are still necessary and these are not yet complete. But the major consideration may have been the fact that the country cannot afford to invest in such a short period such large funds as these major projects require on a longterm basis. We had raised this problem several times and, we think, this is an aspect that needs to be given more attention from the long term point of view, so that, the balance between big, medium-sized and small projects may be evenly maintained in all consecutive plans. This is also necessary because the equipments used in the construction of large projects during one plan will need to be fully utilised in a subsequent plan period till their life expires. Also, the technical experience of an organisation now working in large projects should not be wasted by its dispersal during the second Plan, because it may again be needed in the third Plan.

The targets set for electrification of towns are indeed commendable. But we wonder if side by side with this development full utilisation of power would be made in towns and villages in the realm of small industries, etc. Because a lot of educative and organisational work and promotional devices have to be launched on a large scale for which the present machinery does not seem to be adequate.

The allotments under "Forests", and under "Soil Conservation" are woefully inadequate. It is unfortunate that although lately there has been a lot of talk on these subjects, the full significance of soil conservation practices has not yet been appreciated by either the authorities at the Centre and in the

States or by the intelligentia. This is a realm in which the public can participate with the State on a very large scale and which has great possibilities of fresh employment as well as increase in productivity and capital resources of the soil. However the state of affairs is much better than in the preceding of years.

We are glad to note that sufficient attention is being given to surveys, investigations and research. We would only like to add that on the basis of large river basins plans for the development of water and power resources should be prepared sufficiently in advance. so that in future national planning may not be faced with inadequate data and that continuity of development of these resources in not hampered.

We are astonished to find that inland water transport has not been given the adequate importance it deserves. While it has been admitted on all hands that transport will be the kingpin of the second Plan, it has not been fully appreciated that river transport, which is more economic, could very much lighten the burden of the roads and railways. River transport should be an important and integral feature of all river valley projects. We hope that when the plan is finalised this aspect would be reviewed with fresh thought and outlook.

We are glad to note that the plan has taken full cognisance of the need to develop industries for electricity plants and for earthmoving equipments. We are sure everything necessary will be done to promote them.

The plan has emphasised the need of public participation in river valley projects. But unfortunately there are very few projects where labour co-operatives have been encouraged. Even where some attempts have been made in this respect the experience has not always been equally happy. Such democratic institutions are indeed difficult to work. But, on the other hand, the project authorities themselves have in many cases not developed an encouraging attitude towards them. We very much wish that the matter is given serious attention to by not only the engineers but also the co-operative departments as also the local members of the legislature who can give a public lead.

But there is a great scope for public participation in the matter of improved agricultural practices in areas where irrigating waters and power become available. This is a subject which needs immediate attention if we are to get maximum benefits out of the capital resources being invested in river valley schemes. Distribution of power in towns and villages, through local and municipal utility cooperatives should also be promoted by offering suitable terms.

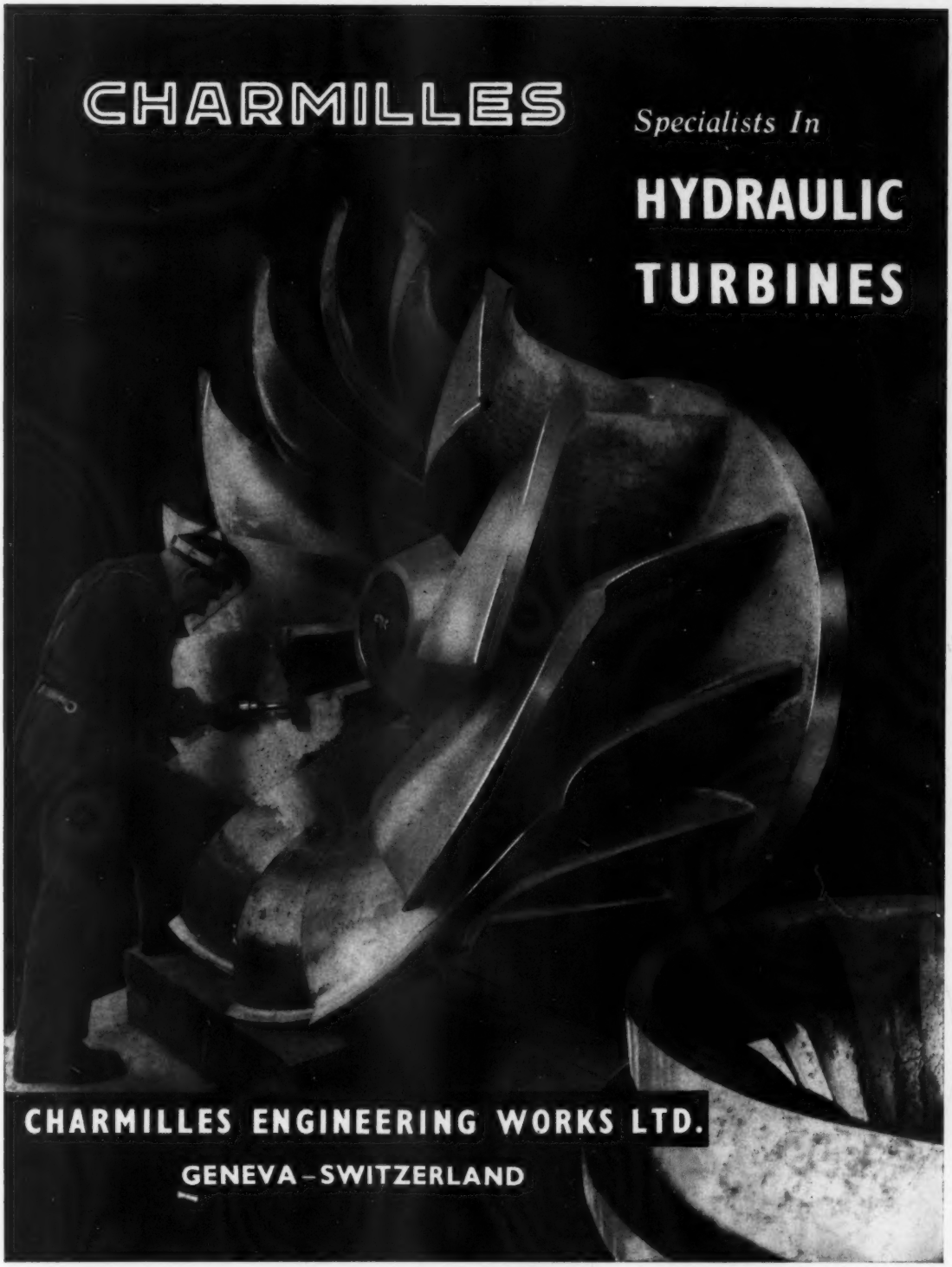
We are glad to note the emphasis that has been laid on technical education for meeting the tremendous volume of technical personnel of all grades. But has it been seriously noted by the proper authorities that technically educated men are often cut off from the influence of humanities and tend to be amoral and insensitive to finer values of life? This defect may largely be due to the fact that the needed emphasis on humanities is not given in technical institutes. It is necessary to review the syllabus as well as the quality of teaching in such institutions, new or old, from this angle. Only in such a manner shall we be able to avoid the production of a class of specialists and technicians who will be more akin to human automatons.

The subject of administration has been given a separate chapter in the Plan. It definitely deserved it. But the chapter has not laid down all that the Planners have in mind. It would, therefore, not be proper to discuss the mere generalities. For example, one of the principal administrative tasks have been mentioned as "organising efficient management for public enterprises, as in industrial undertakings, transport services and river valley schemes" (page 49). But no principles for the same have yet been laid down. The situation regarding river valley project administration is just drifting for a long time and even now is conceived on a purely constructional *ad hoc* perspective. Neither the actual experience made nor the independent criticisms seem to have had any effect on the Government's mind, at least so far as the public is aware of. The organs of State are expanding in all directions without any sense of proportion or perspective. In what way and to what degree they will affect efficiency, economy and the tempo of the work in hand are problems that seem to have been left to force themselves in their own way. "Socialistic pattern means increase of the public sector" has just become a slogan and the administrative implications of this overwhelming trend is only very vaguely and hesitatingly realised. Some boldness of imagination and comprehension is urgently needed in this matter.

Mr. E. A. Bertsch

Mr. E. A. Bertsch, all-India Manager of the Air Conditioning & Refrigeration Department of Voltas Limited, died in Zurich (Switzerland) on January 2, 1956, after a short illness at the age of 50. Mr. Bertsch who came out to India in 1936 to join Volkart Brothers' Air Conditioning Department has been closely connected with the development of air conditioning in this country.

The rapid progress which air conditioning has made in India during the last two decades is in no small measure due to his initiative, engineering skill and optimistic outlook. Great projects such as air conditioning of multi-storeyed buildings and factories or the pre-cooling of aggregates for the Vaitarna Dam, will remain as landmarks in a rapidly expanding industry.



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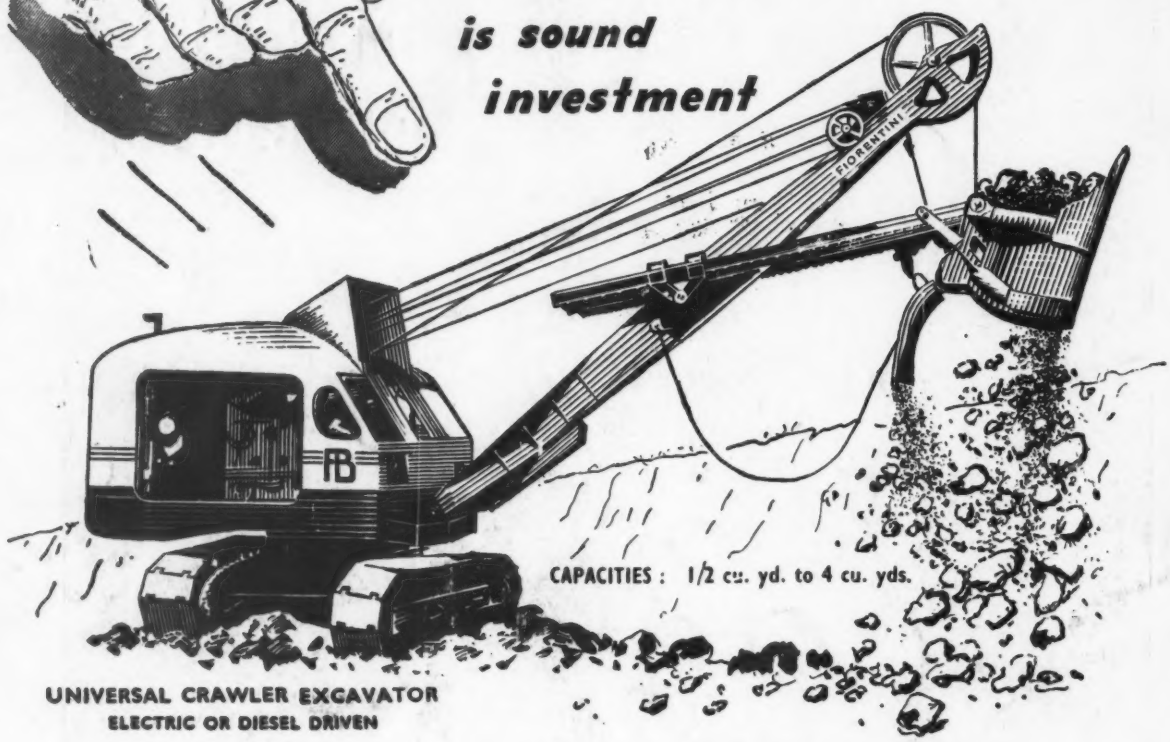

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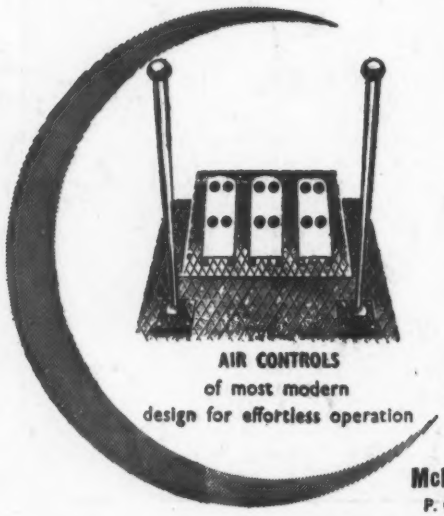

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